E-Lecture Online System

ELONS

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ABSTRACT

In these early years of 21st century, information technology is playing an important role in our lives. With the explosion of knowledge and information nowadays, Information Technology must be adopted to better manage of these aspect especially to increase the quality of teaching and learning. And this is why E-Lecture Online System (ELONS) comes in to bring a better experience in lecturing.

Basically, ELONS is an online system that give better communication between lecturer and students and to make the teaching and learning process more effective. ELONS enable students to get their study material easily. ELONS also provide a center for students to exchange ideas and get help from course mates and lecturer easily and effectively. Students can check their exam result from their hometown at far. Students can read lecturer's announcement online and they get the result of their mid-semester test instantly!

With ELONS, lecturers can give away their notes without much effort. Their announcements reach the student fast and effective. With the Forum in ELONS, lecturers get better understanding of their students level and progress. Lecturers will also be able to manage their student mailing list and contact certain group of student make possible. With the Online-test, lecturers do not have to mark the test paper anymore and a statistics report will be provided almost immediately.

JavaServer Pages (JSP) is chosen to develop ELONS. This is to take advantage of the new JAVA J2EE technology for better technology investment.

With ELONS, hopefully our country will have better quality of University graduates in the future.

ACKNOWLEDGEMENT

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Chapter 1

Introduction

Chapter 1 – Introduction

1.1 Overview

Lecturing is still the most popular method of teaching nowadays. As time goes by, the number of student grow bigger and bigger and the size of a class grow as well, particularly in higher education institution in Malaysia. The consequences are the relation between the lecturer and students become loosen, teaching and learning process become less effective, lecturers as well as students become highly work loaded (because there is more students to handle and more effort is needed to get guide) and etc.

Thus, technology should be adopted to help both parties to overcome those problems. That's why E-Lecture Online System (ELONS) is needed. ELONS is a web-based system that helps both lecturers and student to interact and deal with the teaching and learning process more effectively.

ELONS enable students to get their study material easily, anywhere, anytime with just a few clicks. ELONS also provide a center for students to exchange ideas and get help from course mates and lecturer easily and effectively. Students can check their exam result from their hometown at far. Students can read lecturer's announcement online, no more rushing for lecture when lecturer is on emergency leave. And they get the result of their mid-semester test instantly!

With ELONS, lecturers can give away their notes without much effort. Their announcements reach the student fast and effective. With the Forum in ELONS, lecturers get better understanding of their students level and progress. With the Online-test, lecturers do not have to mark the test paper anymore and a statistics report will be provided almost immediately.

With ELONS, increase effectiveness and easiness and the teaching and learning process would certainly give space for the University to increase the education quality to produce future graduates with better quality.

1.2 Project Motivation

Producing high quality graduates are important for the country growth. ELONS will make teaching and learning more effective and comfortable to achieve this goal.

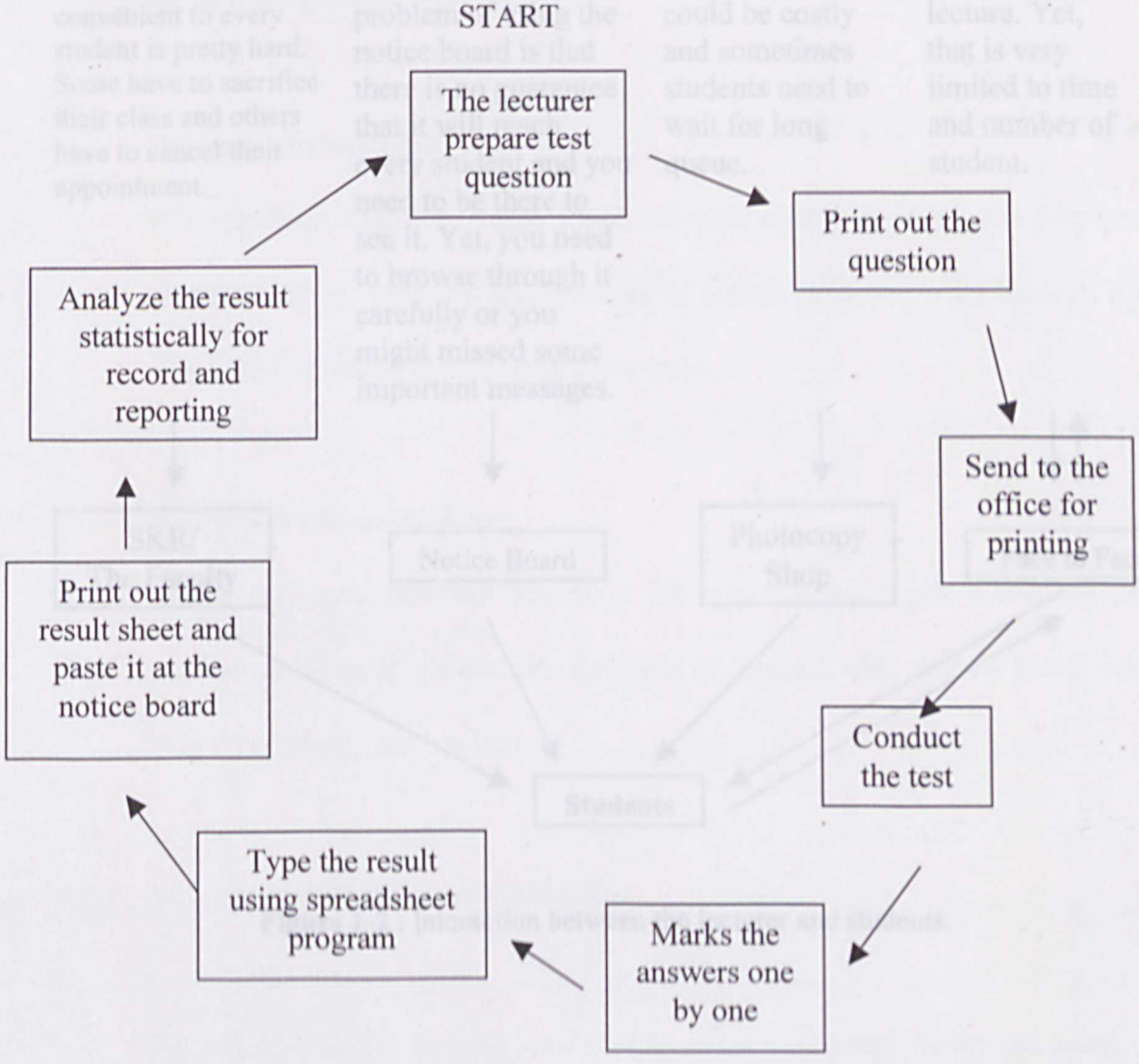


Figure 1-1 : Usual stages that involves to have a test.

1.2.1 Current Situation of Lecturing

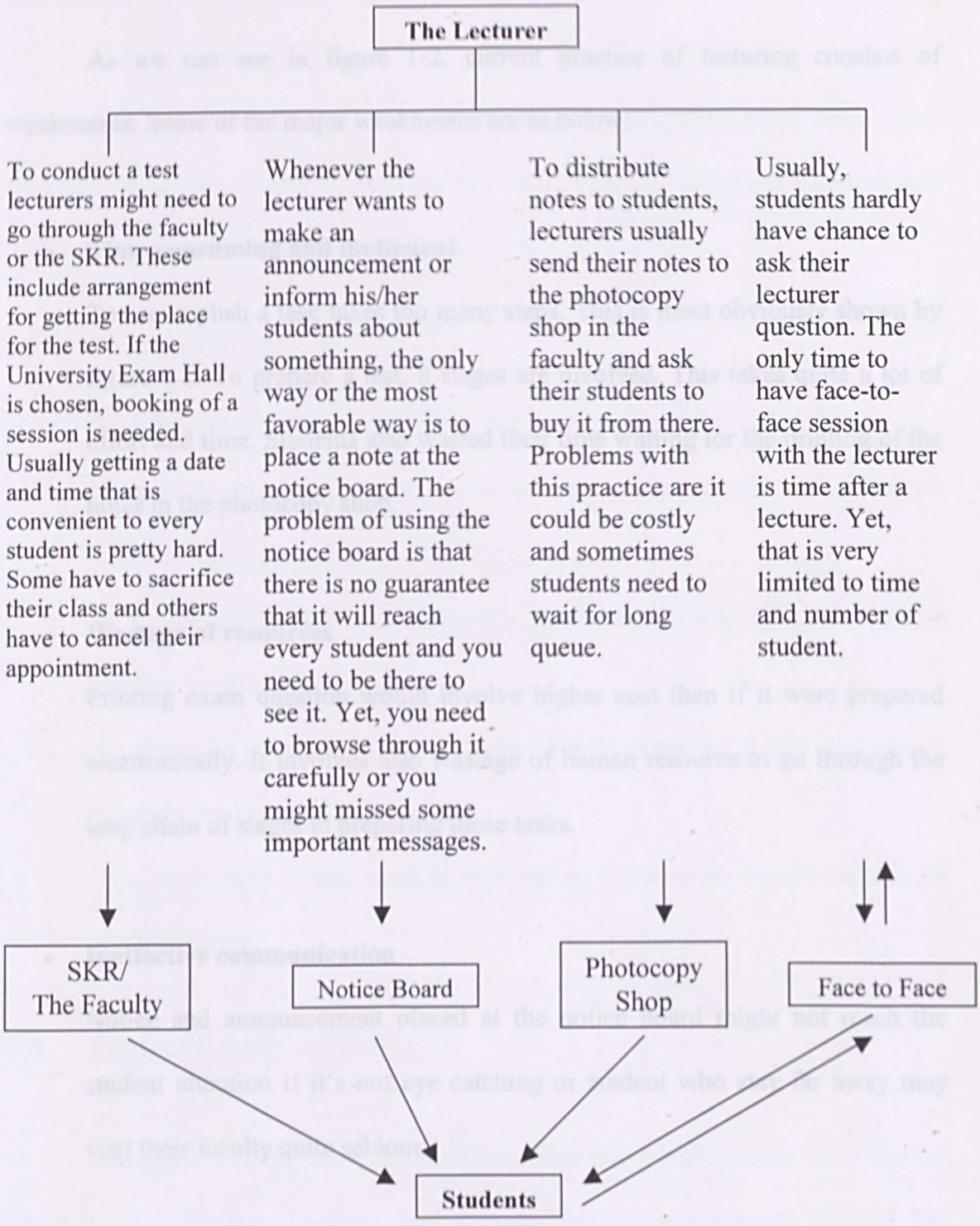


Figure 1-2 : Interaction between the lecturer and students.

1.2.2 Problems with Current Practice of Lecturing

As we can see in figure 1-2, current practice of lecturing consists of weaknesses. Some of the major weaknesses are as below:

- **Time-consuming and inefficient**

  To accomplish a task takes too many steps. This is most obviously shown by figure 1-2. To prepare a test, 8 stages are involved. This takes quite a lot of effort and time. Students also wasted their time waiting for the printing of the notes in the photocopy shop.

- **Wastage of resources**

  Printing exam question would involve higher cost then if it were prepared electronically. It involves also wastage of human resource to go through the long chain of stages in preparing those tasks.

- **Ineffective communication**

  Notice and announcement placed at the notice board might not reach the student attention if it's not eye catching or student who stay far away may visit their faculty quite seldom.

1.2.3 Solution for The Current Situation

An effective online system is needed to solve the current problems faced in lecturing. The system should be able to bring the lecturer and students closer to each

other, make it easier to handle task in preparing a test, save the faculty resources and eliminate some or most of the stages that need to go through when doing a task.

Here is where the E-Lecture Online Systems (ELONS) plays these roles. Shorten the distance between lecturers and their students. Make the lecturers jobs easier and increase the effectiveness in lecturing.

1.3 Project Objectives

Core objectives of the project are as below:

- To provide students a better access to their study material and to let the lecturers have better manage of their teaching material.
- To enable the lecturer and students to communicate well to create a better learning environment.
- To eliminate some unnecessary procedures in preparing a test and reduce lecturers workload.
- To give students instant result of their test so that they are better prepared for the final exam.

1.4 Project Scope

Generally, ELONS can be divided into three major parts, which is the System Administration Section, Lecturer Administrator Section and Student Section. The System Administration Section is to manage the system including give approval to lecturers to use the system. Lecturer Administrator Section allow lecturers to manage their teaching materials, test, students and discussion of a particular course. The

Student Section allows Student to communicate with their lecturer and course mates and access the learning materials easily.

The project scope of ELONS for **System Administration Section** includes:

- Develop a web-based management system to manage the lecturers who are using the system.

The project scope of ELONS for **Lecturer Administrator Section** includes:

- Develop a web-based management system to manage their teaching material.
- Develop a web-based discussion forum to interact with their students.
- Develop an electronic result-publishing unit.
- Develop a web-based application for test result statistics.
- Develop a communication system through electronic announcement board.

The project scope of ELONS for **Student Section** includes:

- Develop a web site to enable students to have fast and easy access to notes and tutorial question remotely.
- Develop an Online test system.
- Develop a web-based discussion forum as a channel to get help related to their study.
- Develop a web site to enable students to check their examination result remotely from anywhere.

1.5 Expected Outcome

Expected outcomes of ELONS for **System Administration Section** include:

- A control that can approve lecturer application and remove lecturer users.
- Lecturers' registration form.

Expected outcomes of ELONS for **Lecturer Administrator Section** include:

- Notes and tutorial management panel – to upload, remove and view notes and tutorials.
- Forum panel – to post, reply, delete and search for topic.
- Result publishing panel – key-in results, print result in table format and updating the result.
- Online test preparation panel – to prepare online test for true/false and multiple choices question.
- Online test regulation panel – to set the instruction and regulation of the test and set the time limit.
- Online test statistics panel – auto-generated statistical report of test taken.
- Student management panel – to manage the students who participate the site and grant right to sit for online test.
- Announcement panel – to make announcements by electronic notice board.

Expected outcomes of ELONS for **Student Section** include:

- Students' registration form.
- Notes and tutorials downloading panels.

- Forum.
- Result viewing page.
- Taking online test.
- Electronic notice board.
- Lecturer contact information.

1.6 Project Schedule

Project Stage	March				April				May				June				July				Aug				Sept			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Preliminary Study and Planning																												
Literature Study																												
System Analysis																												
System Design																												
Prototype																												
Development and Coding																												
Unit Testing																												
System Testing																												
Documentation																												
Implementation and Maintenance																												

Figure 1-3 : Project Schedule

Chapter 2

Review of Literature

Chapter 2 - Review of Literature

2.1 Analysis Studies

2.1.1 Case Study 1 – *Kursus On-line University Malaya*

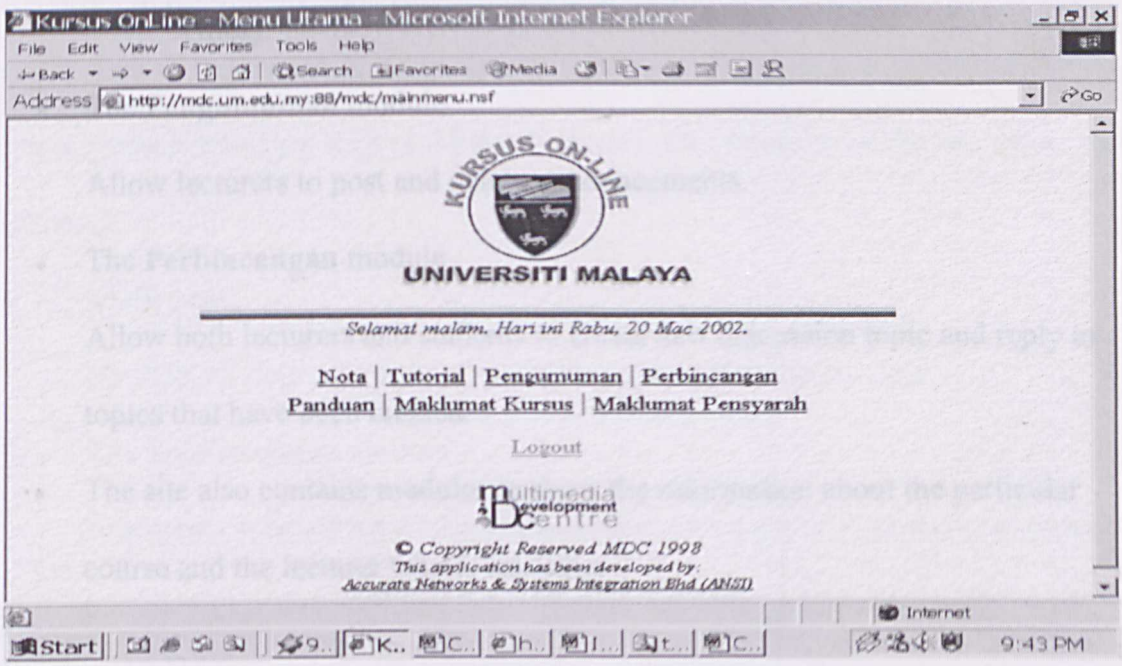


Figure 2-1 : The main page of *Kursus On-line Universiti Malaya*

This site is the official notes downloading site in University of Malaya. Lecture who wants to used the system would have to register online and the approval will be done within one week. Students will be given a general username and password during lecture to access to the site. Some main modules of the site are as below:

- The **Nota** module
  - Students are allowed to view the notes online. They can also save the notes according to the original file format.
  - Lecturers are allowed to upload and delete the notes (files).

- The **Tutorial** module
    - Students are allowed to view the tutorial questions online. They can also save it according to the original file format.
    - Lecturers are allowed to upload and delete the tutorial questions (files).
- The **Pengumuman** module

  Allow lecturers to post and delete announcements.
- The **Perbincangan** module

  Allow both lecturers and students to create new discussion topic and reply to topics that have been created.
- The site also contains modules to show the information about the particular course and the lecturer who is teaching.

2.1.1.1 Result of Study

Strength:

- Simple design and mostly text-oriented make it fast to load.

Weaknesses:

- Low manageability – the option for the lecturer to manage the site is quite troublesome. For example, you cannot delete the notes or discussion topic in-group. You need to do it one by one.
- Poor site flow design – it takes too many step and long flow of pages to accomplish a single task.
- Cannot trace user – because user are not require to register to join discussion. Fake of identity could occur.

2.1.2 Case Study 2 – *Forum Kursus FSKTM*

This site (as shown in figure 2-2) is one of the systems used by FSKTM lecturer. It is created particularly for notes distribution and as a discussion center. Student would need to register to join the discussions. Any username and password can be chosen without knowing their real identity. Some main modules of the site are as the following:

- **Main page**

  Consists of announcement, notes and tutorial questions sections.

- The **Perbincangan** module

  A discussion board where the students post their topics. Title, name of poster, number of time viewed and last reply date and time are shown clearly.

- The **Daftar** module

  Registration page for student to participate in the discussion board

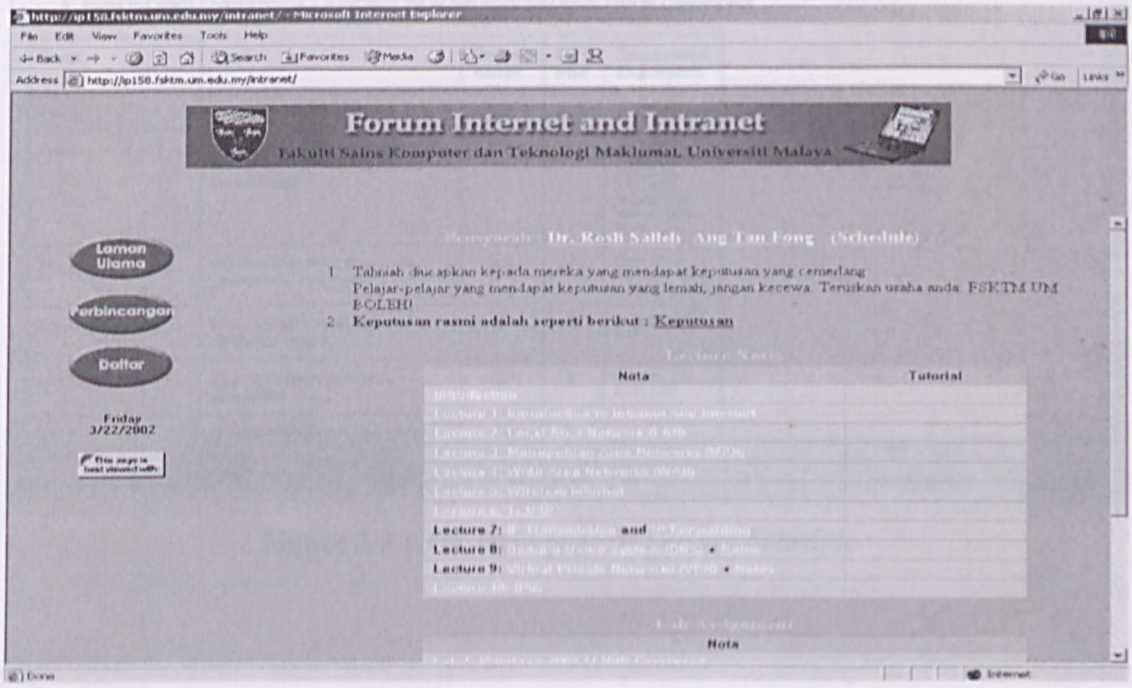


Figure 2-2 : The main page of *Forum Kursus FSKTM*

2.1.2.1 Result of Study

Strength:

- Clear view at the main page. Nice layout and usage of space. Important notice can be seen as you enter the site.
- More interesting design.

Weaknesses:

- Low manageability – there is no module for lecture to manage the site. All are done with hard coding.
- Static content – the site is not very dynamic because of the hard code dependent.

2.1.3 Case Study 3 – *Lecture Schedule*

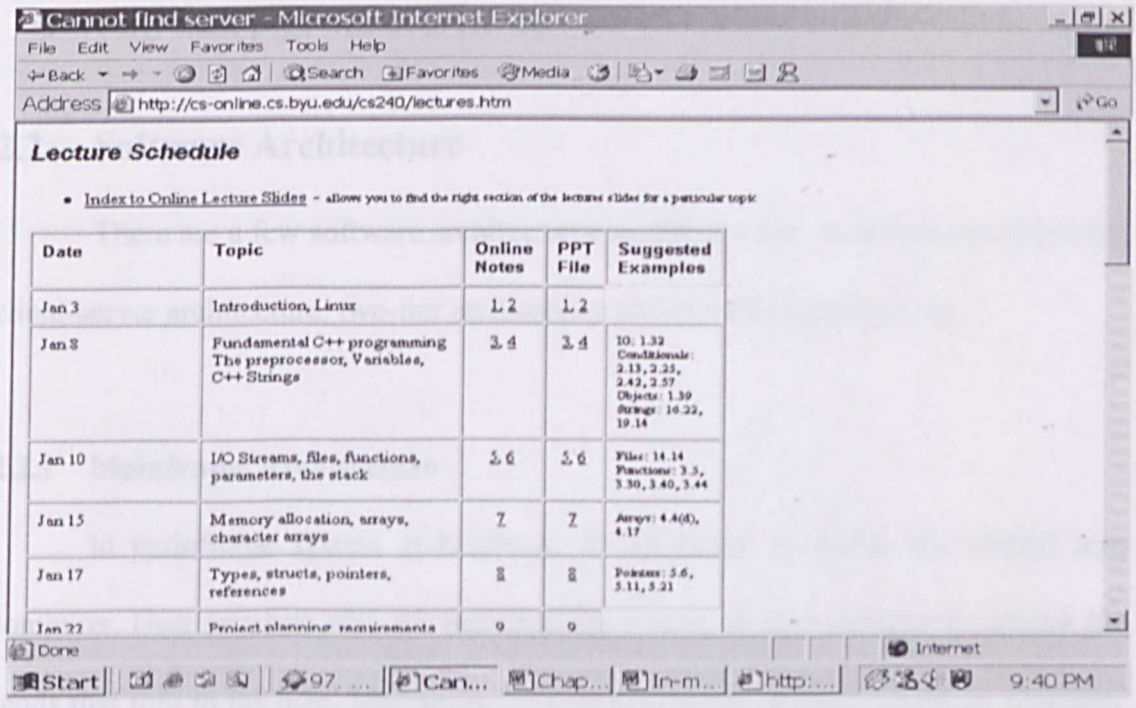


Figure 2-3 : The main page of *Lecture Schedule*

This site is obviously just to let the students to view notes and the lecture schedule of a specific course. It does not have specific modules and have only some basic features as below:

- Online notes viewing as HTML
- Optional notes viewing as Microsoft PowerPoint Files
- Lecture schedule

2.1.3.1 Result of Study

Strength:

- Highly text-based. Fast to load.

Weakness:

- No/Poor GUI design.
- No navigation bar.
- Fully static page written in HTML.

2.2 Software Architecture

There are a few software architectures available now: mainframe architecture, client-server architecture, two-tier architecture and three-tier architecture.

2.2.1 Mainframe Architecture

In mainframe system architecture, all operation is within the central host computer. User interacts with the host through a terminal that captures keystroke and sends that info to the host. Mainframe architecture is not tied to a hardware platform. User interaction can be clone using PCs and UNIX workstations. A limitation of mainframe architecture is that it does not easily supports graphical user interface or accesses to multiple databases from graphically dispersed sites.

2.2.2 Client-server Architecture

Client

Client is a networked information requester, usually a PC or workstation, that can query database and/or other information from a server. Clients rely on servers for resources, such as files, devices, and even processing power.

Server

Server is a computer, usually a high-powered workstation, a minicomputer, or a mainframe, that houses information for manipulation by networked clients. Server is dedicated to managing disk drives (file servers), database (database servers), printers (print servers), or network traffic (network servers).

Client-server

Client-server is a network architecture in which each computer or process on the network is either a client or a server. Client-server architecture implies a cooperative processing of requests submitted by a client, or requester, to the server, which processes the requests and returns the results to the client. The client manipulates the data and presents the result to the user.

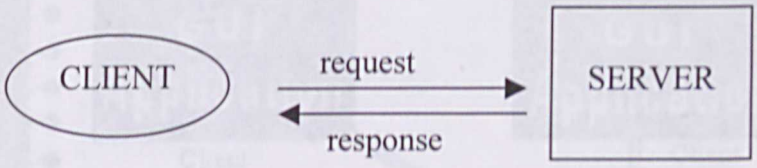


Figure 2-4 : One-to-One Client Server

Client-server solutions can be in a many-to-one design that is more than one client typically makes requests of the server.

2.2.3 Two-Tier Architecture

2-tier architecture refers to client/server architectures in which the user interface runs on the client and the database is stored on the server. The actual application logic can run on either the client or the server. There are only the architecturally tiered data server and client.

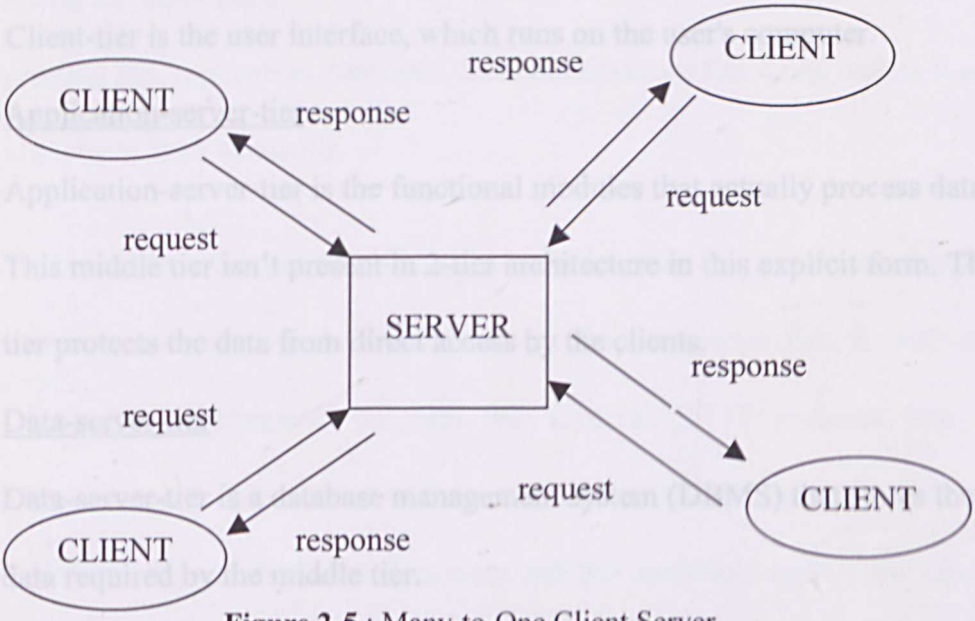


Figure 2-5 : Many-to-One Client Server

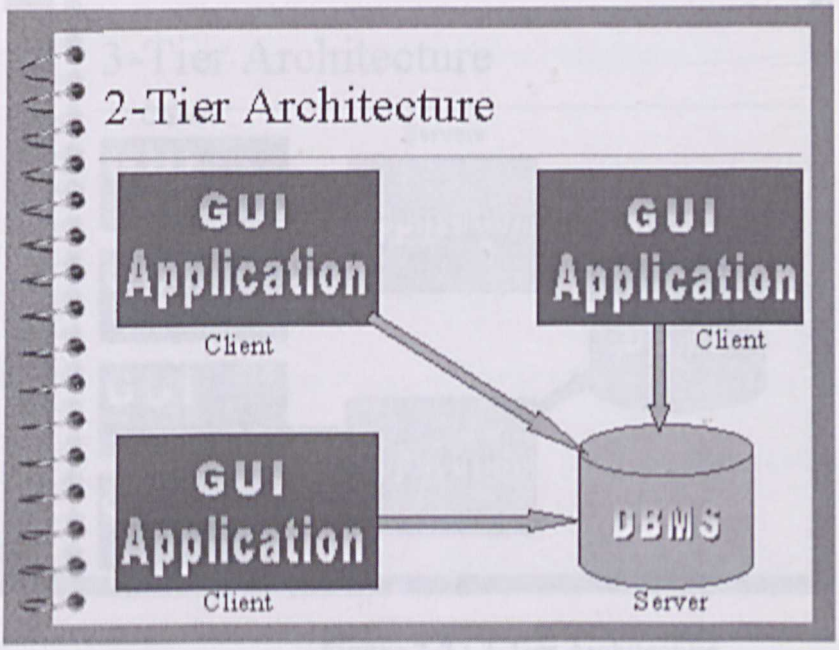


Figure 2-6 : 2-Tier Architecture

2.2.4 Three-Tier Architecture

Three-tier architecture is a special type of client/server architecture consisting of three well-defined and separate processes, each running on a different platform:

The three tiers consist of:

1. Client-tier

   Client-tier is the user interface, which runs on the user's computer.

2. Application-server-tier

   Application-server-tier is the functional modules that actually process data.

   This middle tier isn't present in 2-tier architecture in this explicit form. This tier protects the data from direct access by the clients.

3. Data-server-tier

   Data-server-tier is a database management system (DBMS) that stores the data required by the middle tier.

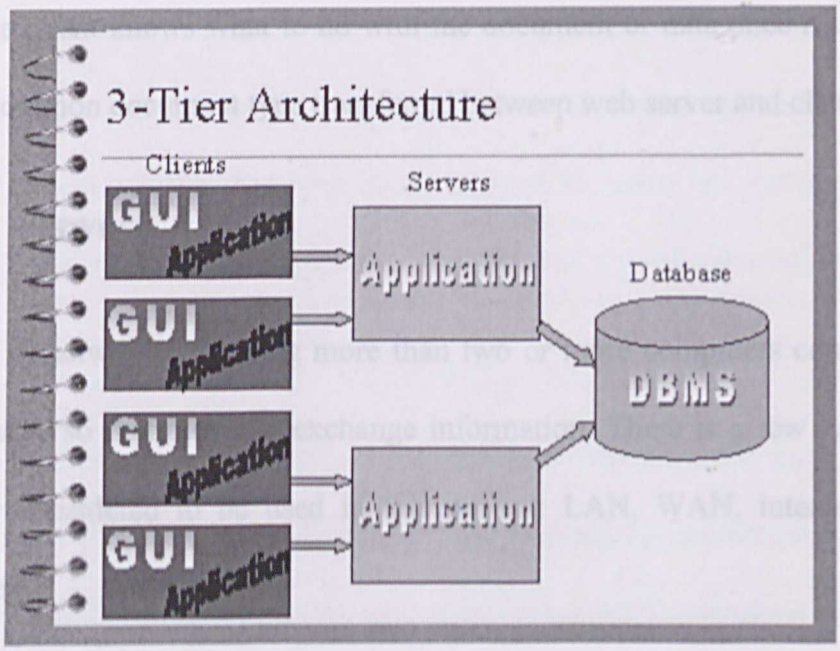


Figure 2-7 : 3-Tier Architecture

2.2.5 Conclusion for Software Architecture

The three-tier architecture is chosen for this project because it is easier to implement and design. The three-tier design has many advantages over traditional two-tier or single-tier designs, the chief ones being:

- The added modularity makes it easier to modify or replace one tier without affecting the other tiers.
- Separating the application functions from the database functions makes it easier to implement load balancing.

In this project, the three tiers consists web browser as client-tier, web server as application-server-tier and database server as the data-server-tier. A web server can be defined as a computer program that receives HTTP requests from web browser for document. Web server will achieve and process the data from database server. Web server return both the document and the document type to the client so that the client knows what to do with the document or data once it is received. The most common document type transferred between web server and client is HTML.

2.3 Network

A network is nothing more than two or more computers connected together by a cable so that they can exchange information. There is a few types of network can be considered to be used in this project: LAN, WAN, internet, intranet and extranet.

2.3.1 Local-Area Network (LAN)

A LAN is a connection between two or more computers, which allows users to share files, programs, or data with a minimum of effort. A LAN is usually local; this means that the machines are located in one physical location -- like a building or just one floor of a building. A LAN tends to use just one set of networking options. For example, a LAN generally uses one network operating system, one type of cable, and one logical topology. A LAN is usually set up for a small group of people such as a department or a division. A LAN is not limited to any particular computer operating system. DOS, Macintosh, and UNIX can all run across a LAN. Actually, they can all run across the same LAN at the same time, if the right software is used.

2.3.2 Wide-Area Network (WAN)

While the geographic distinctions of "local" and "wide" area networks imply a difference in the distance between network nodes that is not always the case. By definition, a Wide Area Network (WAN) is a government-regulated public network or privately owned network that crosses into the public network environment. It doesn't matter whether the area being bridged is across the country or across the street. If the geographical separation crosses over a public thoroughfare, a WAN is required to make the connection.

The WAN is typically used to connect two or more local area networks (LANs). As you know, a LAN is a privately owned communications system that is designed to allow users to access and share resources (computers, printers, servers) with other users. LANs that are interconnected by a WAN may be located in the

same geographical area, such as an industrial park or campus setting, or in geographically separate areas, such as different cities or even different regions.

2.3.3 Internet

Internet is a collection of communication networks interconnected across 2 or more LANs or sub-networks. It is a global network connecting millions of computers. More than 100 countries are linked into exchanges of data, news and opinions.

Each Internet computer, called a host, is independent. Its operators can choose which Internet services to use and which local services to make available to the global Internet community.

There are a variety of ways to access the Internet. Most online services, such as America Online, offer access to some Internet services. It is also possible to gain access through a commercial Internet Service Provider (ISP).

2.3.4 Intranet

Intranet is a term used to refer to the implementation of internet technologies within a corporate organization rather than for external connection to the global Internet. It is a network based on TCP/IP protocols (an internet) belonging to an organization, usually a corporation, accessible only by the organization's members, employees, or others with authorization. An intranet's Web sites look and act just like any other Web sites, but the firewall surrounding an intranet fends off unauthorized access.

Like the Internet itself, intranets are used to share information. Secure intranets are now the fastest-growing segment of the Internet because they are much less expensive to build and manage than private networks based on proprietary protocols.

2.3.5 Extranet

Extranet is a new buzzword that refers to an intranet that is partially accessible to authorized outsiders. Whereas an intranet resides behind a firewall and is accessible only to people who are members of the same company or organization, an extranet provides various levels of accessibility to outsiders. User can access an extranet only if user has a valid username and password, and user's identity determines which parts of the extranet user can view.

2.3.6 Conclusion for Network

Since this is an online system that may access by student nation wide, internet is the most suitable network to be used in this project. Users from different states can access the system if they have internet access. This means that users can keep in touch and get their lecture notes at anytime and anywhere despite of the limitation of geographical barrier.

2.4 Security Technology

Security is an important part in developing a web site. Without a good security system, a web site can be hacked and make the user to loose confidence of web site. SSL is considered for securing the transport of information in DECP.

2.4.1 Secure Sockets Layer (SSL)

SSL is a security protocol designed to ensure data moving between a browser and a server remains private. In theory, someone could intercept information, such as a credit card number while it is in transit between the browser and the server. One solution to prevent information from being usable if it is intercepted is to encrypt it. The most widely implemented encryption system for the web at present is SSL.

SSL is an open, non-proprietary protocol developed by Netscape Communication. It uses industry, accepted RSA public key cryptography for authentication and encryption. The SSL protocol was designed to provide a data security layer between TCP/IP and application protocols such as HTTP, Telnet, NNTP or FTP. SSL provides data encryption, server authentication, message integrity and optional client authentication for TCP/IP connection.

The advantage of the SSL Protocol is that it is application protocol independent. A "higher level" application protocol (e.g. HTTP, FTP, TELNET, etc.) can layer on top of the SSL Protocol transparently. The SSL Protocol can negotiate an encryption algorithm and session key as well as authenticate a server before the application protocol transmits or receives its first byte of data. All of the application protocol data is transmitted encrypted, ensuring privacy.

2.5 Application Server

Application servers are strategic components for any IT infrastructure. They provide a run-time environment and back-end services that give applications the scalability, reliability and performance most enterprises require.

Today's application-server market and the e-commerce market are beginning to converge; a number of vendors are now offering a single platform that includes the underlying application server along with e-commerce and e-business functionality. While some application-server vendors still offer their own development tools, many bundle leading third-party tools in their solutions and can support applications that have been built in other development environments. This approach gives organizations new flexibility for building applications and lets them continue to use development tools that are already deployed and for which they already have expertise.

2.5.1 IBM WebSphere

IBM WebSphere Application Server Advanced Edition 3.5 is for large to midsize companies seeking an enterprise-level e-business solution and for those that want to develop in Java across a common platform. Its strengths include its reliability and integration capabilities, globalization, and platform support. However, the product lacks strong support for third-party management and EAI (enterprise application integration) products.

2.5.2 BEA WebLogic

BEA WebLogic Server is a fully featured, standards-based application server providing the foundation on which an enterprise can build its applications. For all of the crucial tasks of application development and deployment —from integrating enterprise systems and databases to delivering services and collaborating over the Internet —the starting place is BEA WebLogic Server. With its comprehensive set of features, compliance with open standards, multi-tiered architecture, and support for

component-based development, Internet-savvy businesses are choosing WebLogic Server to develop and deploy best-of-breed applications.

2.5.3 ORACLE*9i* Application Server

Oracle*9i* Application Server (Oracle*9*iAS) offers the industry's fastest, most complete and integrated J2EE-certified application server. Oracle*9*iAS has revolutionized the fast-growing application server market by being first to integrate all the technology required to build and deploy e-business portals, transactional applications, and Web services in a single product. Oracle*9*iAS supports all key Java, XML and emerging Web services industry standards.

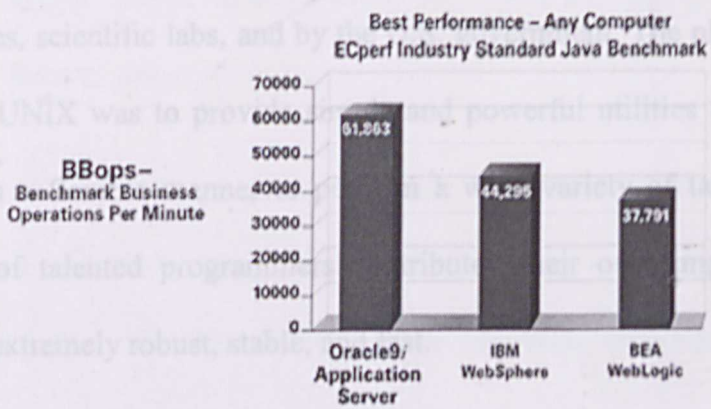


Figure 2-8 : Application servers' comparison

2.6 Operating System

Operating system (OS) is a platform that performs basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.

Besides that, the OS makes sure that different programs and users running at the same time do not interfere with each other. For security, OS ensures that unauthorized users do not access the system. OS provides a software platform to allow application programs run on it.

The most popular operating systems currently are UNIX, Windows 98, Linux.and Windows 2000.

2.6.1 UNIX

UNIX is a much older operating system that was created in the late 1960s. UNIX is designed to provide a multi-user, multitasking system for use by programmers. It began as an open source project that became widely used in Universities, scientific labs, and by the U.S. government. The philosophy behind the design of UNIX was to provide simple and powerful utilities that could be pieced together in a flexible manner to perform a wide variety of tasks. Over the years, hundreds of talented programmers contributed their own improvements to Unix making it extremely robust, stable, and fast.

However, UNIX is more difficult to learn and isn't as widely supported as Microsoft Windows 2000.

2.6.2 Windows 98

Windows 98 is based on the popular Microsoft Windows 95 Operating System, and is designed for the consumer market. Windows 95/98 were designed for backward compatibility with older DOS and 16bit programs, as well as providing a platform for the newer (back in 1995) 32 bit programs.

Windows 98 works better by making it simple to access the Internet and by providing better system performance along with easier system diagnostics and maintenance. With Windows 98, users' system plays better as well with support for the latest graphics, sound, and multimedia technologies, the ability to easily add and remove peripheral devices with support for Universal Serial Bus (USB), and it also enables users to watch TV on PC. Besides that, Windows 98 is compatible with more software (including games) and hardware.

2.6.3 Linux

Linux has gradually become a popular operating system for Internet/ intranet serving purposes. With a host of performance enhancements that will benefit Web sites and Internet sites of all sizes, Linux is a stable and high-performance operating system for Internet usage.

Linux has made progress, primarily in functionality important to Internet infrastructure and Web server capabilities, including a greater selection of drivers, easier installation, GUI-based front ends for Web administration and window management.

2.6.4 Windows 2000

Windows 2000 is Microsoft's latest version of popular Windows NT Operating System. Windows 2000 Server has big improvement over Windows NT 4.0. The changes, both fundamental and cosmetic, have made Windows 2000 faster, more reliable, heavier-duty, and easier to use.

2.7 Database Server

A database is a structured collection of data. To add, access, and process data stored in a computer database, a database server is needed. There are several database server available currently: Oracle, PostgreSQL and MySQL.

2.7.1 Oracle

Oracle is a multi-user database. It provides unprecedented ease-of-user and is pre-tuned and pre-configured for today's dynamic workgroup and line-of-bus environment.

Oracle includes a fully integrated set of easy-to-use management tools, full distribution, replication and web features. Oracle also provides the highest levels of availability through fast fail over, easier management, and zero data loss disaster protection, with Data Guard, the only complete data protection solution available on the market.

Oracle can runs on UNIX, Linux and Windows platform. However, it is expensive and separate licenses are required for each of its database engine.

2.7.2 PostgreSQL

PostgreSQL is a sophisticated Object-Relational DBMS, supporting almost all SQL (Structures Query Language) sconstructs, including subselects, transactions, and user-defined types and functions. It is the most advanced open-source database available anywhere.

PostgreSQL is an enhancement of the POSTGRES database management system, a next-generation DBMS research prototype. While PostgreSQL retains the powerful data model and rich data types of POSTGRES, it replaces the PostQuel

query language with an extended subset of SQL. PostgreSQL is free and the complete source is available.

PostgreSQL runs on Solaris, SunOS, HPUX, AIX, Linux, Irix, FreeBSD, and most flavours of Unix.

2.7.3 MySQL

MySQL is a relational database management system. MySQL stores data in separate tables rather than putting all the data in one big storeroom. This adds speed and flexibility. The tables are linked by defined relations making it possible to combine data from several tables on request.

MySQL is a small, compact, easy to use database server, ideal for small and medium sized applications. It is client/server implementation that consists of a server and many different client programs. It is available on a variety of UNIX platforms, Linux, Windows NT, Windows 95/98 and Windows 2000.

MySQL is Open Source Software. Open Source means that it is possible for anyone to use and modify. Anybody can download MySQL from the Internet and use it without paying anything. Anybody can study the source code and change it to fit their needs.

2.7.4 Microsoft SQL Server

Microsoft SQL Server 7.0 is a single process, multithreaded relational database server primarily intent for transactional processing. It is based on the client/server architecture, which divides processing into two components: a front-end, or client component, that run on a local workstation and a back-end, or server component, that runs on a remote computer.

2.8 Data Access Technology

ELONS will require data access technology to enable communication and access to its various database. A few of the Microsoft Data access strategy and technology is reviewed and considered.

2.8.1 Universal Data Access (UDA)

UDA is a high-level specification developed by Microsoft for accessing data objects regardless of their structure. The strategy of Universal Data Access is to assure open, integrated, standards-based access to all types of data, that is from SQL to non-SQL to even unstructured data across a wide variety of applications, from traditional client/server to the web. The main components of UDA are ADO, OLE DB and ODBC.

2.8.2 ADO (Active Data Object)

Active Data Object (ADO) is the Microsoft's newest high-level interface for data objects that most applications developers will use.

ADO is designed to eventually replace *Data Access Objects (DAO)* and *Remote Data Objects (RDO).* Unlike RDO and DAO, which are designed only for accessing relational databases, ADO is more general and can be used to access all sorts of different types of data, including web pages, spreadsheets, and other types of documents.

ADO provides consistent access to data for creating a front-end database client or middle-tier business object using an application, tool, language, or even an

Internet browser. ADO is the single data interface for developers creating 1 to n-tier client/server and Web-based data-driven applications.

2.8.3 OLE DB

OLE DB Providers are the data access engines or services, as well as the business logic components that these applications can use in a highly interoperable, component-based environment.

OLE DB is a set of interfaces that are designed to provide data access to *all* data, regardless of type, format or location. It effectively "componentizes" database and related data processing functionality, breaking it up into interoperable components that can run as middleware on the client or server across a wide variety of applications. The OLE DB architecture provides for components such as direct data access interfaces, query engines, cursor engines, optimizers, business rules and transaction managers.

The concept of OLE DB is to explode the database into its basic parts. OLE DB delivers components, external to the database, that provide this typical database functionality in a reusable component architecture. And these components, because they are not directly linked to the database itself, can be shared across multiple applications, systems and data stores to provide a higher level, universal interface.

2.8.4 ODBC (Open Database Connectivity)

ODBC is a standard database access method developed by Microsoft Corporation. The goal of ODBC is to make it possible to access any data from any application, regardless of which database management system (DBMS) is handling

the data. ODBC manages this by inserting a middle layer, called a database *driver*, between an application and the DBMS. The purpose of this layer is to translate the application's data queries into commands that the DBMS understands. For this to work, both the application and the DBMS must be *ODBC-compliant* -- that is, the application must be capable of issuing ODBC commands and the DBMS must be capable of responding to them. Since version 2.0, the standard supports SAG SQL.

2.8.5 JDBC

JDBC technology is an API that lets you access virtually any tabular data source from the Java programming language. It provides cross-DBMS connectivity to a wide range of SQL databases, and now, with the new JDBC API, it also provides access to other tabular data sources, such as spreadsheets or flat files.

The JDBC API allows developers to take advantage of the Java platform's "Write Once, Run Anywhere" capabilities for industrial strength, cross-platform applications that require access to enterprise data. With a JDBC technology-enabled driver, a developer can easily connect all corporate data even in a heterogeneous environment

2.9 Language

2.9.1 ASP

ASP is a server-side scripting technology. ASP is indeed HTML page with an .asp extension. ASP allows for HTML and a scripting language such as VBScript, JScript or Perl to be interspersed in a Web page. When a browser requests an ASP page, the Web server generates a page with HTML code and sends it back to the browser.

One of the most important features about ASP is that it allows user to easily access data and put it on a Web page. User can simply display data from an ODBC-compliant database, or use ASP to make decisions about what to display on a Web page. User can then format the results in any way that they please.

Another important ASP feature is the ability to use cookies to store and retrieve information. The Request object has a Cookie collection, and user can use this in data processing.

2.9.2 PHP

PHP Hypertext Preprocessor is a open-source server-side, HTML embedded scripting language used to create dynamic Web pages for e-commerce and other Web applications. In an HTML document, PHP script (similar syntax to that of Perl or C) is enclosed within special PHP tags. Because PHP is embedded within tags, the author can jump between HTML and PHP (similar to ASP and Cold Fusion) instead of having to rely on heavy amounts of code to output HTML. And, because PHP is executed on the server, the client cannot view the PHP code.

PHP offers excellent connectivity to most of the common databases (including Oracle, Sybase, MySQL, ODBC and many others). PHP also offers integration with various external libraries, which allow the developer to do anything from generating PDF documents to parsing XML.

PHP is the natural choice for developers on Linux machines running Apache server software, but runs equally well on any other UNIX or Windows platform, with Netscape or Microsoft Web server software. PHP also supports HTTP sessions, Java connectivity, regular expressions, LDAP, SNMP, IMAP, COM (under windows)

protocols. It also supports WDDX complex data exchange between virtually all Web programming languages.

2.9.3 ColdFusion

ColdFusion is a product created by Allaire Corporation of Cambridge, Mass. that includes a server and a development toolset designed to integrate databases and Web pages. Cold Fusion web pages include tags written in Cold Fusion Markup Language (CFML) that simplify integration with databases.

Coding for ColdFusion pages is much more straightforward and intelligible than JavaScript, VBScript, C++ or Java, even while providing high levels of functionality. The tags themselves conform to the basic HTML syntax of tag name followed by tag attributes, and are enclosed in the familiar HTML brackets (<>). Most tags are two-sided, and can be combined with each other and with HTML elements to create custom tags for use in ColdFusion applications.

2.9.4 JSP (JavaServer Pages)

JavaServer Pages™ (JSP) is a web-scripting technology that can mix static HTML content with server-side scripting to produce dynamic output. By default, JSP uses Java as its scripting language; however, the specification allows other languages to be used, just as ASP can use other languages (such as JavaScript and VBScript). While JSP with Java will be more flexible and robust than scripting platforms based on simpler languages like JavaScript and VBScript.

JSP provides a number of server-side tags that allow developers to perform most dynamic content operations. So developers who are only familiar with scripting, or even those who are simply HTML designers, can use JSP tags for generating simple output. Advanced scripters or Java developers can also use the

tags, or they can use the full Java language if they want to perform advanced operations in JSP pages.

2.9.5 Javascript

Javascript is a scripting language developed by Netscape to enable web authors to design interactive sites. Javascript is different from Java. Although it shares many of the features and structures of the full Java language, it was developed independently. Javascript can interact with HTML source code to enable web authors to spice up their sites with dynamic content. JavaScript is endorsed by a number of software companies and is an open language that anyone can use without purchasing a license. It is supported by recent browsers from Netscape and Microsoft, though Internet Explorer supports only a subset, which Microsoft calls Jscript.

2.10 Authoring Tools

2.10.1 Microsoft Visual InterDev

Microsoft Visual InterDev is a Web development tool designed for programmers to create an interactive Web page with data is as simple as dragging and dropping, setting some properties, and saving the page. No coding is required in using Visual InterDev.

Visual InterDev includes site design tools that help user easily plan pages, organize their links, and apply a consistent theme to your Web site. Visual InterDev includes three ways to view your HTML and ASP pages.

These three views are the cornerstone of Visual InterDev. They replace the simple source code editor included with Visual InterDev 1.0 and supports design-time controls (DTCs), debugging, statement completion, and object browsing.

The new data environment provides easy commands for making Web application data-driven. Instead of burying complex SQL statements deep within an .asp file, the statements are now exposed, maintained, and reused at the application level through the data environment under the Global asp file. Instead of modifying the query within each page, developers can modify the data command and changes are incorporated into files that reference that data command. Developers also can drag fields from the command directly onto HTML or ASP page.

However, for those so inclined, Visual InterDev exposes a full object model that allows developers to fine-tune their application, perform client validation, and have full control of Web application. Visual InterDev supports not only full-reach applications, using the ASP engine to produce simple HTML pages for the client, but also DHTML and Microsoft Internet Explorer 4.0 data binding for a richer client experience.

2.10.2 Notepad

Notepad is the world's most versatile HTML editing tool absolutely free when purchase this software: Windows version 2.0 and above.

Notepad has one of the simplest user interfaces of any Internet Web authoring tools. The menus are logically laid out, conforming to all standards in design, so users can understand them before use Notepad.

Notepad has the same interface for all versions of Windows, so moving over to the latest version of Windows should not hamper HTML code creation. The Notepad web-authoring tool is compatible with every single standard of Internet presentation medium yet devised. Notepad was designed to have a very small application footprint, taking up as little space as possible in computer's memory, and a minimum of disk space.

Notepad gives clear, easy to read and full HTML. There is no code hidden, and users have control over all parts of the HTML code. JavaScript is also fully supported by Notepad. All parts of the JavaScript are fully available through Notepad, without the need of complex tools.

2.10.3 EditPlus

EditPlus is an Internet-ready 32-bit text editor, HTML editor and programmer's editor for Windows. While it can serve as a good replacement for Notepad, it also offers many powerful features for Web page authors and programmers.

EditPlus supports powerful and customizable syntax highlighting for HTML, CSS, PHP, ASP, Perl, C/C++, Java, JavaScript and VBScript by default. Also, users can create their own syntax file to support other programming languages, such as ASP, Java and PHP.

EditPlus includes features:

- Internet features

  Seamless web browser for previewing the content of HTML document or Java applet without leaving the editor. Browser window also has common browser commands so users can browse Internet web sites as well as local HTML files. FTP commands for uploading local files to FTP server or for editing remote files directly. Highlights URL and e-mail addresses in normal text files and lets you activate them with a single keystroke (F8) or 'Ctrl + double-click'.

- HTML toolbar

  The HTML Toolbar allows users to insert common HTML tags quickly and easily. It also supports useful tools such as HTML Color Picker, Character Picker, Table Generator and Object Picker.

- Document selector

  The Document Selector offers quick mouse access to all document windows currently loaded. Much faster than selecting on Window menu or pressing Ctrl+Tab key multiple times.

- User tools

  EditPlus supports user-defined tools, help files and keystroke recording files. The output of tool execution can be captured in the Output Window, so that users can double-click the error line to automatically load the file and locate the cursor to that line.

- Auto-completion

  Auto-completion is a timesaving feature, which changes a short abbreviation into a complete string. It supports Perl and C/C++ by default. Also, users can create their own auto-completion file to support other programming languages.

- Cliptext window

  The cliptext window is collection of text clips for quick and easy access. Users can easily customize them, and can also create on cliptext file..

- Document template

  Document template offers a quick start when create a new document.

2.10.4 Macromedia Dreamweaver MX

Macromedia Dreamweaver is professional visual editor for creating and managing web sites and pages. It gives developers the productivity of a visual web page layout tool, the control of an HTML text, editor and support for new web technologies, all in one software packing.

Developers can use it to create web sites visually, with confidences that HTML being generated is concise and always editable. It includes advanced features that takes advantage of the latest innovations on the web, such as dynamic HTML and CSS, while still ensuring that web pages work well in a variety of web browsers. All of the code generated by it is carefully created to work on as many platforms and browsers as possible.

Others features include easy integration of Active X components, Java applets, Plug-ins for improved web page interactivity. It also integrates seamlessly

with other components of Macromedia, such as Flash Movies, Shockwave, and Fireworks, which are essential for the development of interactive web pages.

2.10.5 Adobe Photoshop

Adobe Photoshop is the most popular image-editing available for Macintosh and Windows-based computers. It is used as drawing, painting and designing purposes. Users can retouch an image, apply special effects, swap details between photos, introduce text and logos, adjust color balance, and even add color to a grayscale scan. All these functions are included under a set of user-friendly editing tools in Adobe Photoshop. It contains graphical icons to represent every functions of each button. Besides that, it also provides many shortcut keys that is easier and save time for users and for those who do not like to use mouse.

Chapter 3

System Requirements Analysis

Chapter 3 - System Requirements Analysis

3.1 Methodology

The system development methodology is a method to create a system with a series of steps or operations or can be defined as system life cycle model. Every system development process model (see Figure 3-1) includes system requirements (user, needs, resource) as input and a finished product as output.

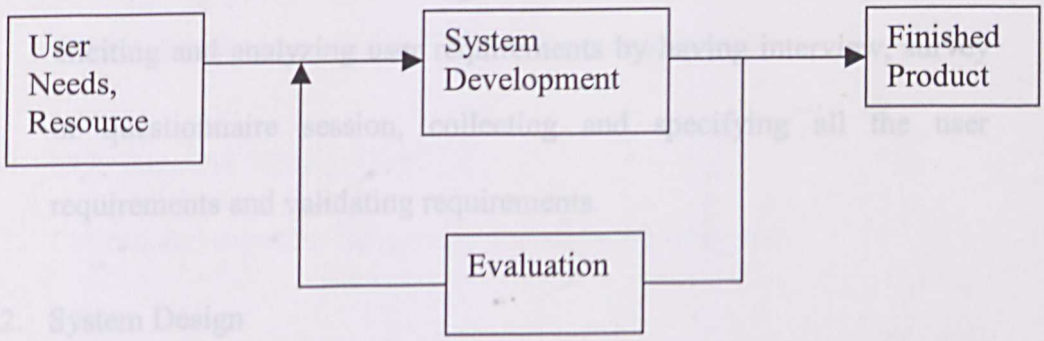


Figure 3-1 : System Development Process Model

There are several process models in system development:

1. Waterfall Model with prototyping
2. V Model
3. System Development Life Cycle (SDLC)
4. Spiral Model

Waterfall Model with prototyping is chosen for ELONS because:

- A good specification to begin with.
- Easy to use
- Systematic

- Scope of project well understand
- Project risks have been accessed and are considered to be low.

3.1.1 Waterfall Model with Prototyping

Waterfall Model with prototyping consists of eight stages that are depicted as cascading from one to another (see Figure 3-1). Each development stage should be completed before the next begins. The eight stages are:

1. Requirements Analysis

   Understanding and determining users need by having brainstorming, eliciting and analyzing user requirements by having interview, survey or questionnaire session, collecting and specifying all the user requirements and validating requirements.

2. System Design

   Outlining system functional by having feasibility studies or case studies on current system, determining and specifying hardware or software architecture and verifying system design.

3. Program Design

   Determining and specifying program design and database design and verifying program design.

4. Coding

   Involving programming, personal planning, tool acquisition, database development, component level documentation and programming management.

5. Unit and Integration Testing

   Test units separately and integrate the tested units. Then, testing on the integrated units.

6. System Testing

   Combining all the integrated units into a system. Testing on the system. Specifying, reviewing and updating of the system test and validating of system.

7. Acceptance Testing

   Testing on system completed. The system is delivered.

8. Operation and Maintenance

   Control and maintain the system. Revalidating of system.

The system has to be validated and verified during the stage of system testing. The verification is to make sure that the function in the ELONS works correctly and to check the quality of the implementation. The validation is to ensure that ELONS has implemented all the requirements in the specification.

Prototyping is a sub-process and prototype is a partially developed product or a simple simulator of the actual system to examine the proposed system and overview on the functionalities. A prototype of ELONS will be built regarding to the project scope and the analysis of the system before start to built the actual system.

Prototyping is very important because:

- To ensure the system meet the performance goals or constraints.
- To ensure the system are practical and flexible.
- To ensure the system fulfill the users' requirement.
- To have an insight of how the module and sub-modules interact with each other.

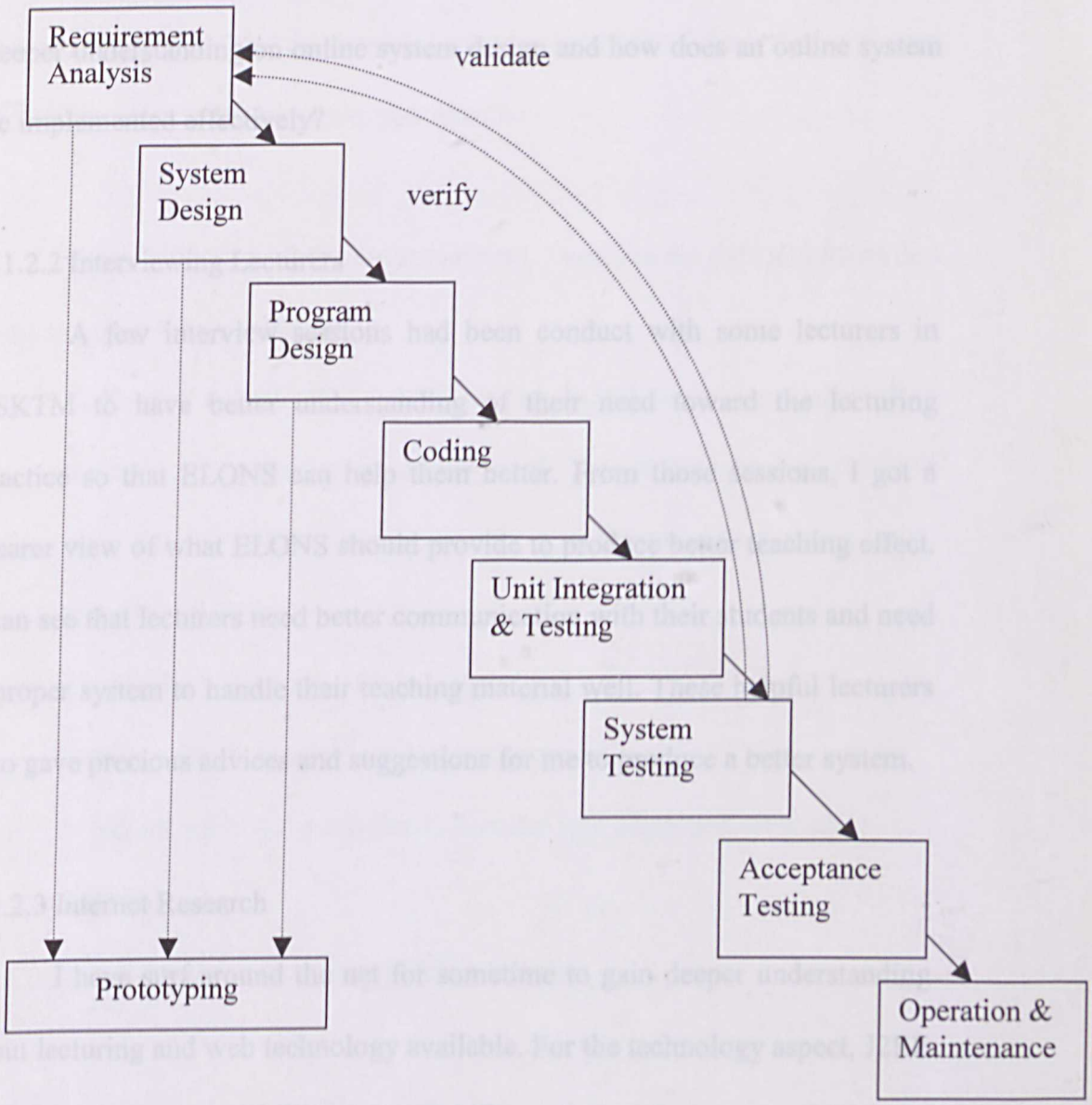


Figure 3-2 : Waterfall Model with Prototyping

3.1.2 Techniques Used To Define Requirements

Effective and appropriate techniques must be used to define and elicit users requirements. Research methods that usually used are library research, interview, Internet research and survey.

3.1.2.1 Library Research

I went to library to search books related to online system to have a deeper understanding on online system design and how does an online system be implemented effectively?

3.1.2.2 Interviewing Lecturers

A few interview sessions had been conduct with some lecturers in FSKTM to have better understanding of their need toward the lecturing practice so that ELONS can help them better. From those sessions, I got a clearer view of what ELONS should provide to produce better teaching effect. I can see that lecturers need better communication with their students and need a proper system to handle their teaching material well. These helpful lecturers also gave precious advices and suggestions for me to produce a better system.

3.1.2.3 Internet Research

I have surf around the net for sometime to gain deeper understanding about lecturing and web technology available. For the technology aspect, J2EE was chosen for its scalability and portability and most important of all is its easiness to integrate with current and future system.

3.1.2.4 Survey

In order to make my survey success, I have prepared 30 sets of questionnaire (see Appendix A). My respondents are students in the campus who use the system. The objective of my questionnaire is to find out what problems they have with the current system and how can I improve it.

The respondents were asked to answer the questionnaire on the spot to ensure I can get back all the sets of questionnaire. Each of them took not more than 10 minutes to answer the questionnaire.

After collecting all the questionnaires, I analyze the data and identified some major problem as below:

- Sometime downloading notes can be troublesome especially when multiple notes need to be downloaded. This is because one needs to view the file before he/she can save it to the secondary storage (e.g. diskette and CD).
- Hard to find session to talk to lecturer.
- Passive attitude to approach lecturer personally.
- Impatient waiting for test result, because it is important for study planning.
- Didn't see the notice place by their lecturers.

3.1.2.5 Summary of User Requirements

From the research above, I found that both lecturers and students need better communication between each other. They are also looking forward for a

more user-friendly system to upgrade the teaching and learning process. The system that they are expecting should achieve basically the goal below:

- Bring the lecturers and students together (better communication).
- Well control on the teaching and learning material. (easier to manage)
- Instant result.
- Avoid the trouble of marking small test paper.
- Calculating and analyzing student performance without much effort.

3.2 Functional Requirements

Functional requirement is a statement of the service or functions that a system should provide how the system reacts to particular inputs, and how the system should behave in particular situations. **[Sommerville, 1998]**

The functional requirement for ELONS consists of three main parts: System Administration Section, Lecturer Administrator Section and Student/User Section. For System Administration Section, functional requirement consists of registration module for lecturers and lecturer management modules. For Lecturer Administrator Section and Student Section, functional requirement includes notes and tutorials module, forum module, result module, online test module, announcement module and student registration and management module. Finally there is an authentication module that controls the access of those three levels of user.

3.2.1 Authentication Module

This module check for the user's level when one login to the system and bring him to the control that he had access to. User needs to key in a valid user name and password to be able to use the system.

3.2.2 Registration Module

There are two parts of registration module. One is for the lecturer to register and the other is for student to register. For the lecturer part, a lecturer needs to apply to the System Administrator by stating what course he is teaching and his stuff ID. The lecturer needs to wait for the System Administrator's approval before he can get access to the Lecturer Administrator Section.

For the student part, students have to register themselves for the courses that they are taking. Instant access will be given once registration is successful. But the lecturer will control access to the online test.

3.2.3 User Management Module

There are also two parts of user management module. One is to manage lecturer by the System Administrator and the other is to manage students by the lecturers. Basically, this module allow administrator to add and remove user, view and edit user's info and also give some rights to user, for example the right to sit for online test.

3.2.4 Notes and Tutorials Module

Basically, this module allows students to view and download notes and tutorial questions. The lecturers will have more control such as upload files and remove notes and tutorial.

3.2.5 Forum Module

User can search for discussion topics by using keywords, post new topic or question and reply to topic. Lecturer administrator may also delete a topic and to banned a student from using the forum for a specific duration of time.

3.2.6 Result Module

Students can view their exam result here. Lecturer can key in the result of his students. The students' matriculation number will be auto generated by the system. Lecture can also update the result that he already keyed in. Final result can be printed in table format.

3.2.7 Online Test Module

There are only two types of question that are allowed for the online test. They are true-false question and multiple choices question. Before create a test, lecturers are allow to choose weather they want to prepare a pure true-false question test, a pure multiple choices question test or mix of both types.

General rules and instruction for taking the test will be generated by the system. However, the lecturer can add additional instruction. The lecturer can also set the time limit for the test.

Result will be shown just after the student finish the test by clicking the submit button. A statistics of the test result will also be available for the lecturer instantly.

3.2.8 Announcement Module

The students can see the announcement made by the lecturer at the main page once they login successfully. The lecturer can post, update and remove an announcement. The lecturer has also an option to make an announcement through email by group. The lecturer is able to create student group as he like. By default, there is a group create by the system which contain the email list of all students that are taking the particular course.

3.3 Non-Functional Requirements Analysis

Non-functional specifications are the constraints under which a system must operate and the standards which must be met by the delivered system **[Sommerwille, 1995]**. The new E-Lecture Online System must ensures certain web application qualities like user-friendliness, correctness, functionality, reliability, flexibility, efficiency as well as maintainability.

3.3.1 User-Friendliness

User interfaces design creates an effective communication medium between a human and a computer. Therefore, it is very important to make sure that the interfaces fulfill user-friendliness so that it would not cause trouble to users. The Golden Rules **[Mandel, 1997]** coins three rules:

- Place the user in control

  This will define interaction modes in a way that does not force a user into unnecessary or undesired actions. Besides, it also provides flexible interaction for different users for instance via mouse movement and keyboard commands.

- Reduce the user's memory load

  One of the principles that enable an interface to reduce the user's memory load is by reducing demand on short-term memory. The interface should be designed to reduce the requirements to remember past actions and results.

- Make the interface consistent

  The interface design should apply to consistent fashion where all visual information must be organized according to a design standard that is maintained throughout all screen displays. Apart from that, input mechanisms are constrained to a limited set that are used consistently throughout the application. Lastly, mechanisms for navigating from task to task are consistently defined and implemented.

3.3.2 Correctness

A program or system must operate correctly or it provides little value to its users. Correctness is the degree to which the software performs its

required function. To ensure this application quality, lots of testing and trial-and-errors will be carried out.

3.3.3 Functionality

The functionalities stressed here are the searching and retrieving capability, which is very important in any web application that deal with data retrieval from existing database. Besides, navigation and browsing features as well as application domain-related features will be taken into account.

3.3.4 Reliability

Reliability is the extent to which a program can be expected to perform its intended function with required precision **[Pressman, 2001]**. It is closely related to correct link processing, error recovery and user input validation and recovery. This quality is essential as it indicates how far users will be confident in the implementation of the new computerized system in getting daily minutes processing done.

3.3.5 Flexibility

For the ELONS, flexibility of the system is stress on the Java-based system, which is able to receive user request from multi-platform. In other words, whether a user makes request from Windows-platform computer or Linux-platform computer, the user is able to retrieve the appropriate output. This is indeed the strength of the technology used in developing the ELONS.

3.3.6 Efficiency

Undeniable, efficiency is the main key for implementing the new meetings management system. Efficiency is understood as the ability of a process procedure to be called or accessed unlimitedly to produce similar performance outcomes at an acceptable or credible speed **[Sommerwille, 1995]**. Efficiency is measured base on response time performance, page generation speed and graphics generation speed.

3.3.7 Maintainability

System maintenance accounts would require more effort if the system is not designed according to good programming practices. Maintainability is the ease with which a program can be corrected if an error is encountered, adapted if its environment changes, or enhanced if the customer desires a change in requirements **[Pressman, 2001]**. As the to-be-developed ELONS will be built by using JSP in J2EE which is java-based programming that enhances object-oriented concept, therefore, it is strongly believed that bugs or system faults can be detected and fixed in the shortest time. This is because object-oriented design makes sure that each class or object will only strictly handle one particular task or functionality.

3.3.8 Security

The proposed system has also security measures to minimize the risk of data exposure to unauthorized people.

3.4 Chosen Platform, Application Server, Database and Tools

3.4.1 Chosen Development Platform

For the ELONS, Windows is chosen as the development platform. Microsoft's Windows 2000 is built to work with a series of microprocessors from the Intel Corporation that share the same or similar sets of instructions.

The main reason for choosing Microsoft's Windows 2000 as the development operating system is because most of the computers in FSKTM are currently installed with Windows 2000. Therefore, the implementation of the new system can be done easily and effectively.

3.4.2 Chosen Database Management System

After considering some DBMS in the market, Oracle9i Database is chosen to power ELONS.

Oracle9*i* Database is the state of the art in object-relational databases. Voted Editors Choice by PC magazine and the #1 database for Linux by Linux Journal, Oracle9*i* Database is the most scalable and full featured database available. Whether driving your web site, packaged applications, data warehouses or OLTP applications, Oracle9*i* Database is a foundation technology for any professional computing environment

3.4.3 Chosen Development Data Access Technology

JDBC is chosen as the data access technology because of the features below:

i) JNDI support

- Ease of deployment (gives JDBC driver independence, makes JDBC applications easier to manage)

ii) Connection pooling

- Performance improvement (a connection pool is a cache of database connections that is maintained in memory, so that the connections may be reused)
- Important for implementing a distributed transaction processing system

iii) JavaBeans™ (RowSet objects)

- Send data across a network to thin clients, such as web browsers, laptops, PDAs, and so on
- Access any tabular data source, even spreadsheets or flat files
- Make results sets scrollable or updatable when the JDBC driver does not support scrollability and updatability
- Encapsulate a driver as a JavaBeans component for use in a GUI

3.4.4 Chosen Development Application Server

JSP is web server-independent, which means it can be developed in IIS, Apache Web Server or any other web server. In this proposed system, Oracle 9i Application Server has been chosen as the development web server as it has been fully developed as Java-based J2EE compliant Application

Server by Oracle Corporation. With simple configuration, it is able to run the application smoothly as expected.

3.4.5 Chosen Web Development Tool

JSP has been selected as the web development tool for the proposed system. The reasons of choosing JSP are as follows:

Benefits of Servlets Over "Traditional" CGI:

- Efficient

  With traditional CGI, a new process is started for each HTTP request. If the CGI program itself is relatively short, the overhead of starting the process can dominate the execution time. With servlets, the Java Virtual Machine stays running and handles each request using a lightweight Java thread, not a heavyweight operating system process.

- Convenient

  Servlets have an extensive infrastructure for automatically parsing and decoding HTML form data, reading and setting HTTP headers, handling cookies, tracking sessions and many other high level utilities. Servlets is especially convenient for those who already know Java Programming Language.

- Powerful

  Servlets support several capabilities that are difficult or impossible to accomplish with regular CGI. Servlets can talk directly to the Web Server, whereas regular CGI programs cannot, at least not without using a server-specific API. Multiple servlets can also share data, making it easy to

implement database connection pooling and similar resource-sharing optimizations. Servlets can also maintain information from request to request, simplifying techniques like session tracking and caching of previous computations.

- Portable

  Servlets are written in Java programming language and follow a standard API. In fact, servlets are supported directly or by plug-in on virtually every major Web Server. They are now part of the Java 2 Platform, Enterprise Edition (J2EE), so industry support for servlets is becoming even more pervasive.

- Secure

  CGI programs often executed by general-purpose operating system shells. This becomes the main weakness of CGI programs as whenever programmers forgot to consider certain array check, the system will be opened up to deliberate or buffer overflow attacks. In this case, servlets suffer from neither of these problems as if a servlet executes a remote system call to invoke a program on the local operating system, it does not use a shell to do so.

- Inexpensive

  There are several free or inexpensive Web Server available that are good for "personal" use or low-volume Web sites. Exclusive Apache, most commercial-quality Web Servers are relatively expensive. Besides, for any

Web Server, no matter its cost, adding a servlet support to it (If it doesn't come preconfigured to support servlets) costs very little extra.

Benefits of JSP :

- Versus Active Server Pages (ASP)

  Even though ASP is a competing technology from Microsoft, the advantages of JSP are twofold. First, the dynamic part is written in Java, not VBScript or another ASP-specific language, so it is more powerful and better suited to complex applications that require reusable components. Second, JSP is portable to other operating systems and Web servers.

- Versus pure Servlets

  JSP documents are automatically translated into servlets behind the scenes. Nevertheless, relatively, it is more convenient to write regular HTML than to have a zillion *println* statements that generate the HTML. To some Web page design experts they can build the HTML using familiar tools and leave places for the servlet programmers to insert the dynamic content.

- Versus Server-side Includes (SSI)

  SSI is widely supported technology for inserting externally defined pieces into a static Web page. JSP is better because you have a richer set of tools or building that external piece and have more options regarding the stage of the HTTP response at which the piece actually gets inserted.

- Versus JavaScript

  JavaScript, which is completely distinct from the Java programming language, is normally used to generate HTML dynamically on the client,

building parts of the Web page as the browser loads the document. This is a useful capability but only handles situations where the dynamic information is based on the client's environment. With the exception of cookies, the HTTP request data is not available to client-side JavaScript routines. Relatively, Java is far more powerful, flexible, reliable and portable.

- Versus Static HTML

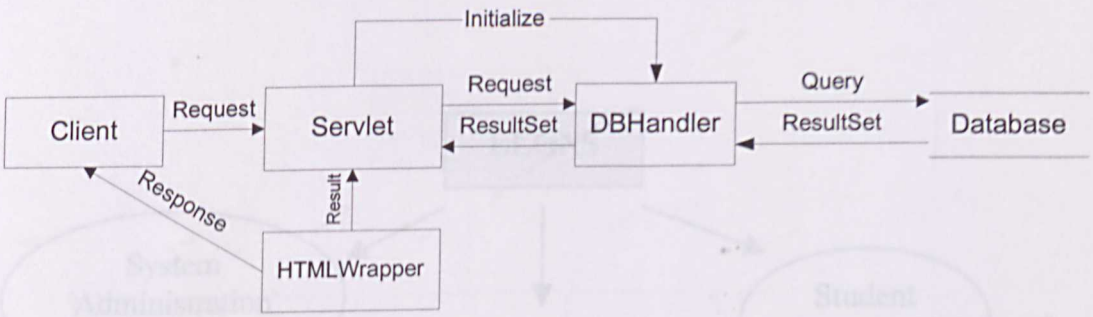
Regular HTML cannot contain dynamic information, so static HTML pages cannot be based upon user input or server-side data sources. JSP is so easy and convenient and it enables a mixture of regular static HTML with dynamically generated content from servlets.

Chapter 4

System Design

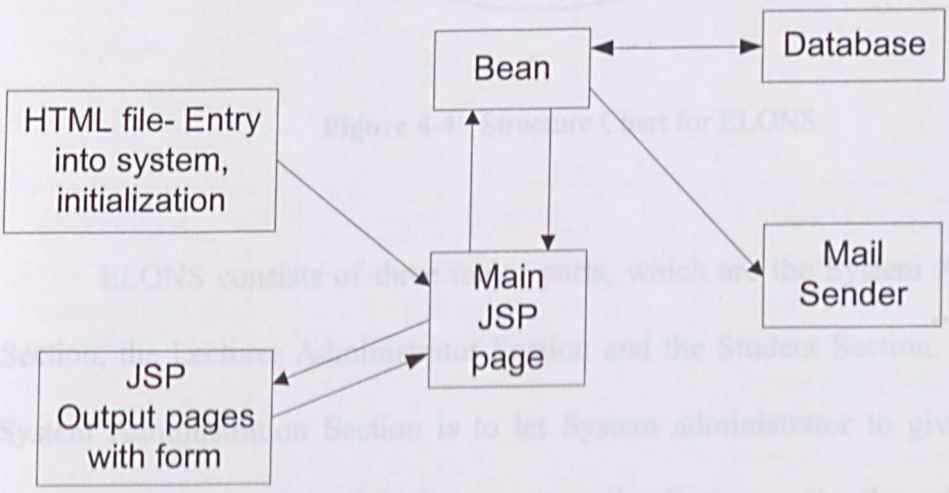
Web server connected to a "middle tier" application, and a persistent store that is frequently a relational database. (Refer to Figure 4-1)

ELONS will be using JSP as the web development tool. After the middle tier receives client's requests, in the same tier, Java servlets will communicate with java classes to decide ways to process the data in order to generate desired output to users. Apart from using Java servlets, Java bean can be used to communicate with the relational database. A simple illustration on both the ways abovementioned is displayed in Figure 4.2 and Figure 4.3.



[Source: Myers, Thomas A ,1999]

Figure 4-2 : Communication between Java Servlets and Database to get relevant output.



[Source: Myers, Thomas A ,1999]

Figure 4-3 : Communication between Java Bean and Database to get relevant output.

The main purpose of having a three-tier architecture is to assign main functionality to each tier to ensure no function overlapped. Different people could handle each tier using different languages. Therefore, whenever there is error or system fault occurs, the problems can be detected and fixed easily without interfering other tier.

4.3 System Functionality Design

4.3.1 System Structure Charts

The objective of system structure chart is to show how the modules in ELONS are related to each other.

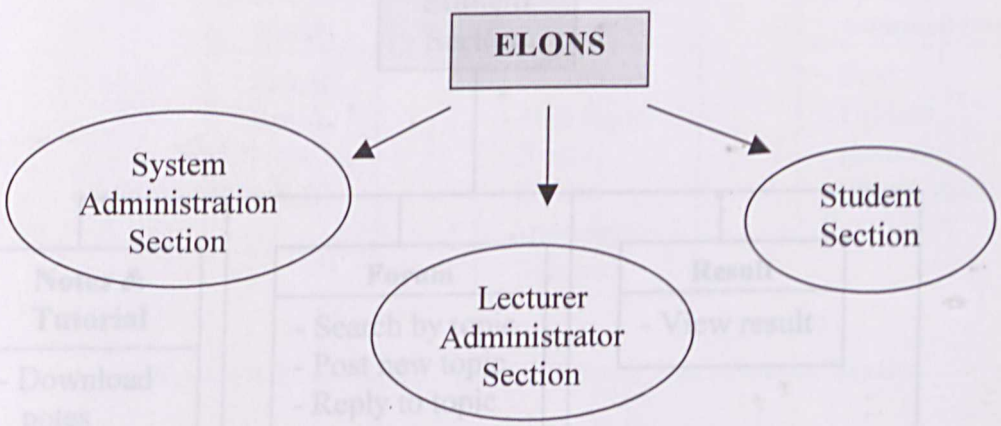


Figure 4-4: Structure Chart for ELONS

ELONS consists of three major parts, which are the System Administration Section, the Lecturer Administrator Section and the Student Section. Basically, the System Administration Section is to let System administrator to give approval to lecturer to use the system and to manage the lecturers. On the other hand, the Lecturer Administrator Section is to let lecturer to manage and control the e-

lecturing. Finally, the Student Section lets students to access and to use the system as the end-users.

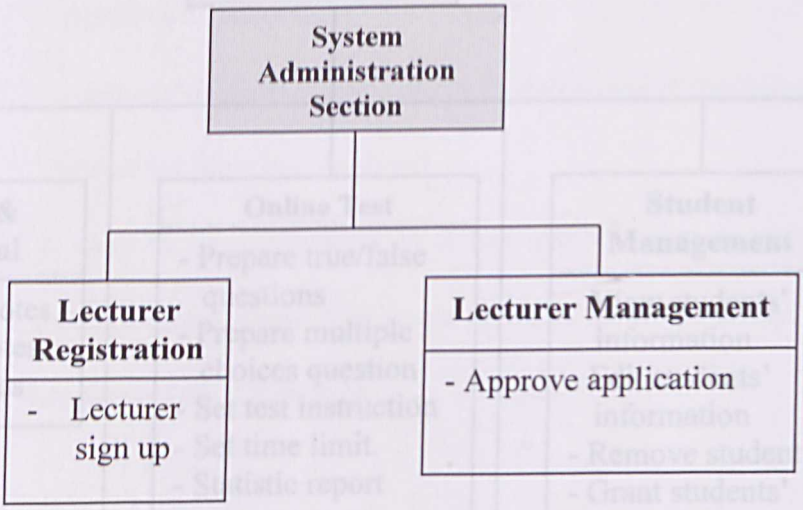


Figure 4-5 : Structure Chart for System Administration Section

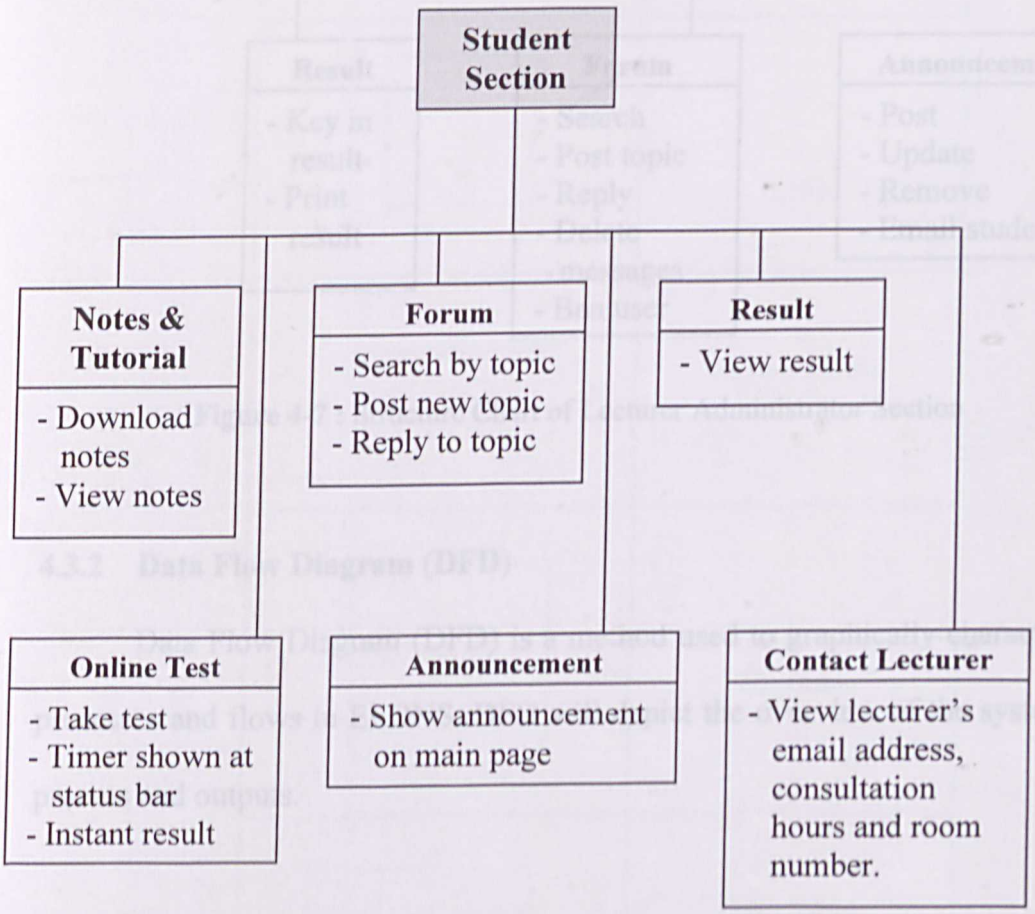


Figure 4-6: Structure Chart for Student Section

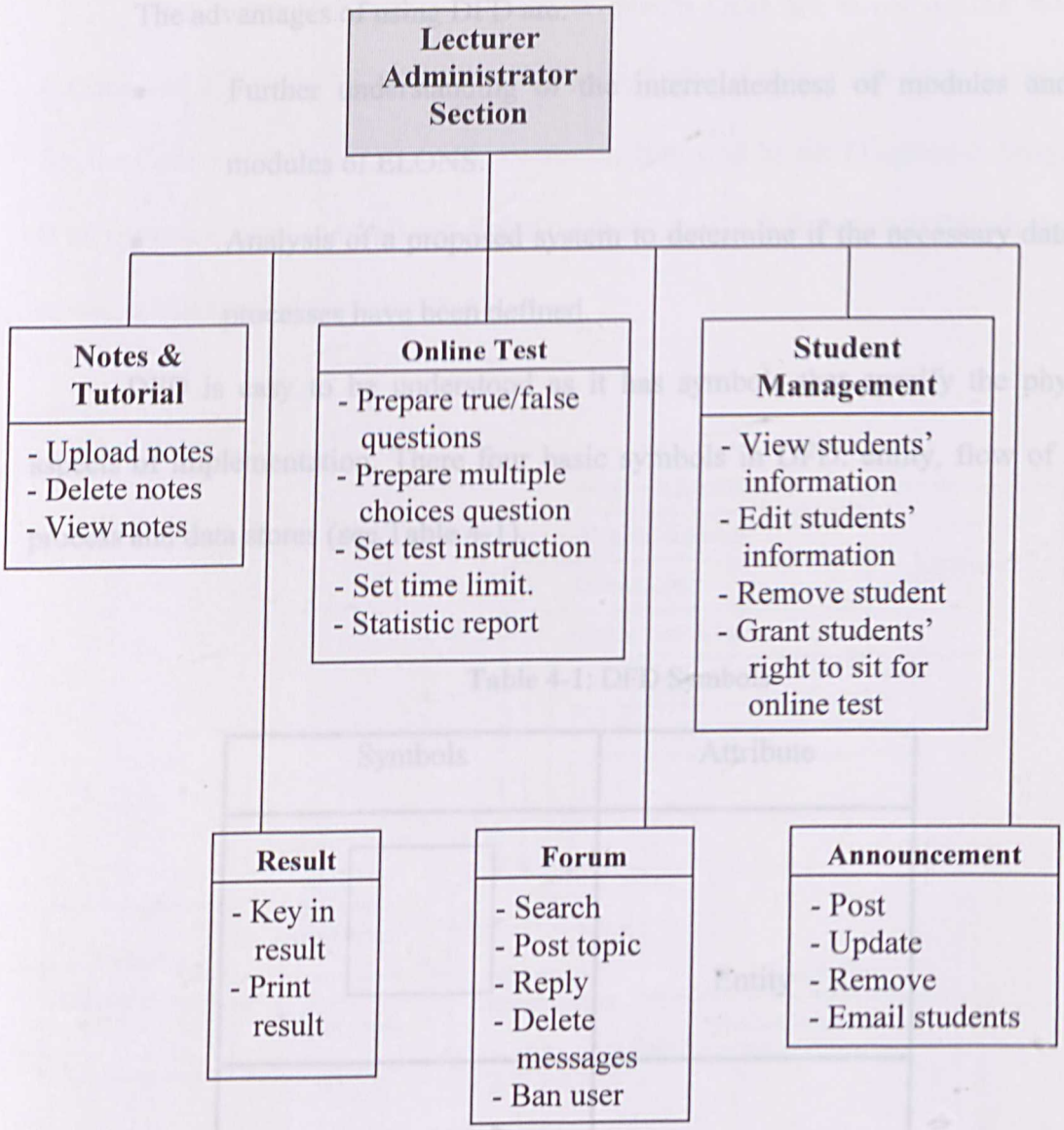


Figure 4-7 : Structure Chart of Lecturer Administrator Section

4.3.2 Data Flow Diagram (DFD)

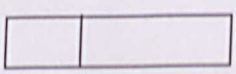
Data Flow Diagram (DFD) is a method used to graphically characterize data processes and flows in ELONS. DFD will depict the overview of the system inputs, process and outputs.

The advantages of using DFD are:

- Further understanding of the interrelatedness of modules and sub modules of ELONS.
- Analysis of a proposed system to determine if the necessary data and processes have been defined.

DFD is easy to be understood as it has symbols that specify the physical aspects of implementation. There four basic symbols in DFD: entity, flow of data, process and data stores (see Table 4-1).

Table 4-1: DFD Symbols

Symbols	Attribute
	Entity
	Flow of Data
	Process
	Data Store

The convention, which is used to design DFD are based on the work by C.Gane and T.Sarson. The data flow is conceptualized with a top-down perspective. So, the Context Level Diagram will be drawn, followed by the Diagram 0. Diagram 0 is an overview process of all the major modules in ELONS that includes all the data stores, entities and process involved.

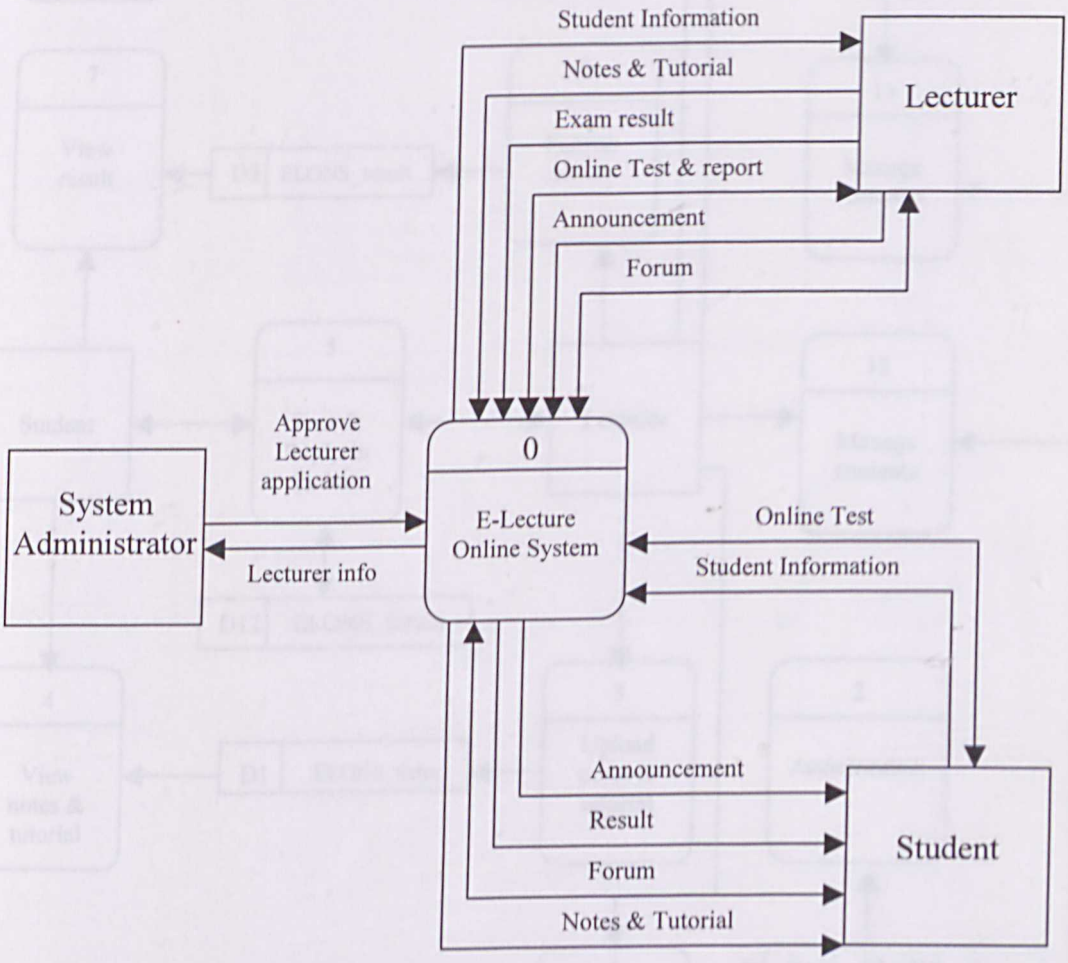


Figure 4-8 : Context Level Diagram of ELONS

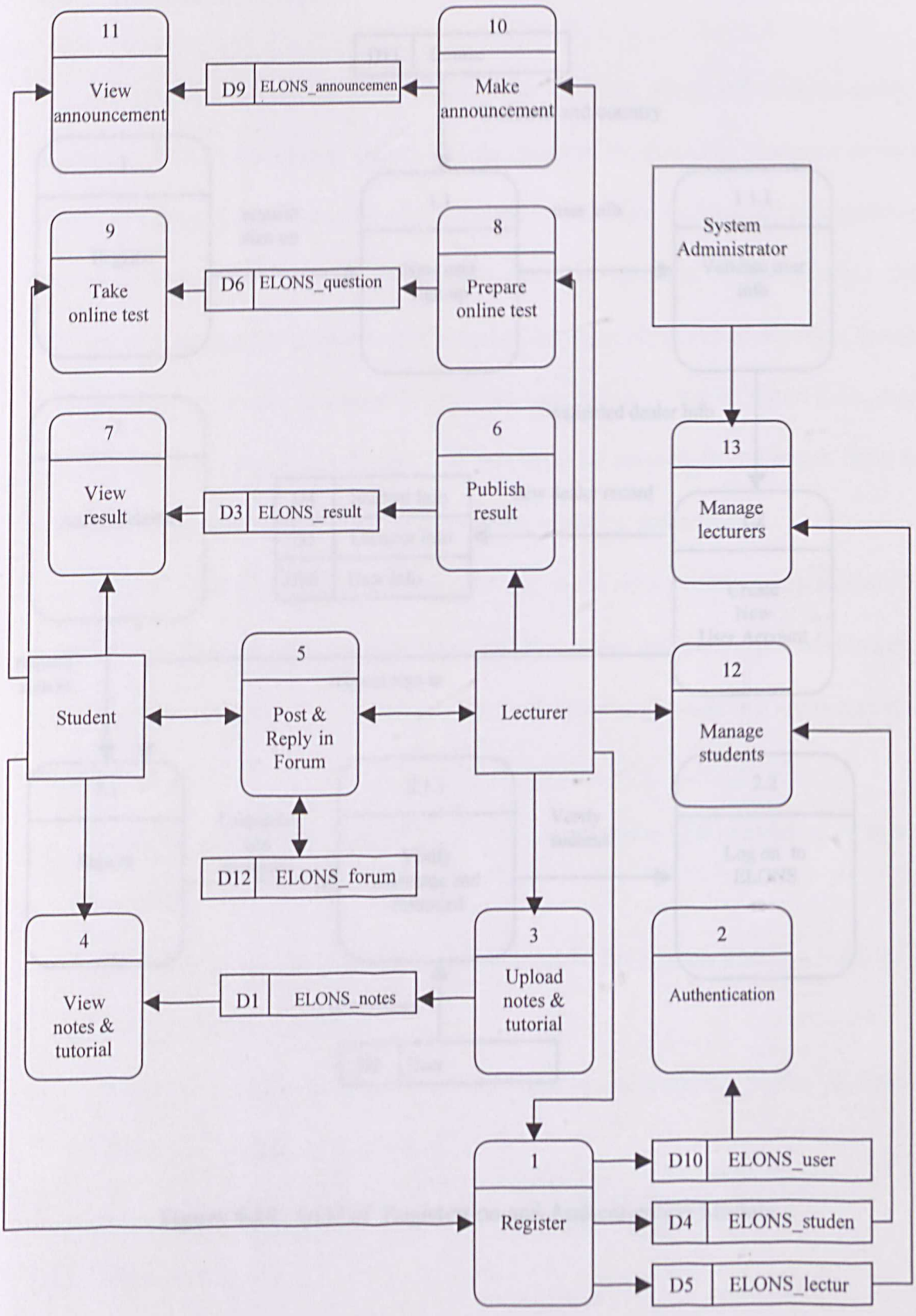


Figure 4-9 : Diagram 0 of ELONS

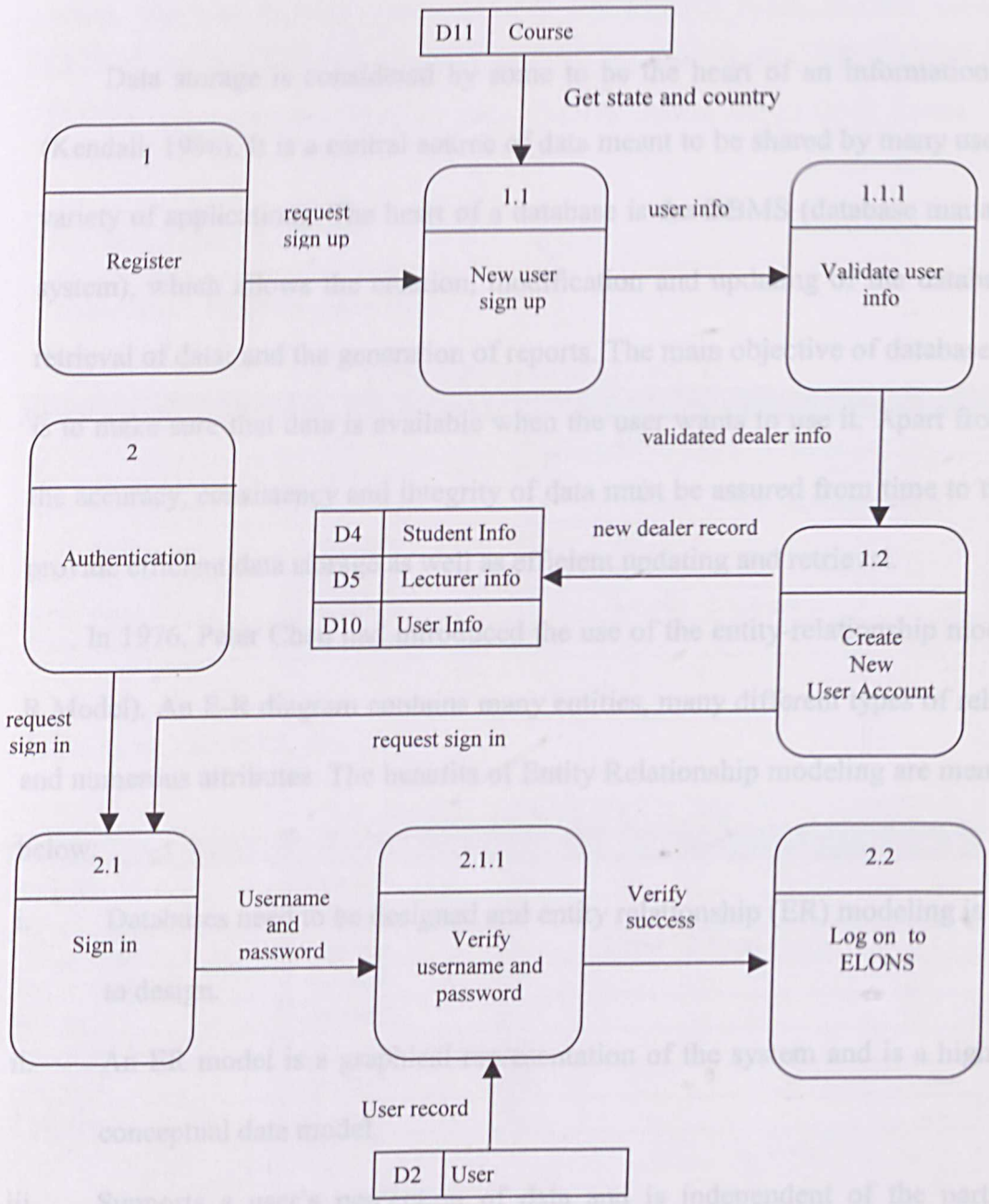


Figure 4-10 : DFD of Registration and Authentication Module

4.4 Database Design

Data storage is considered by some to be the heart of an information system (Kendall, 1996). It is a central source of data meant to be shared by many users for a variety of applications. The heart of a database is the DBMS (database management system), which allows the creation, modification and updating of the database; the retrieval of data; and the generation of reports. The main objective of database design is to make sure that data is available when the user wants to use it. Apart from that, the accuracy, consistency and integrity of data must be assured from time to time, to provide efficient data storage as well as efficient updating and retrieval.

In 1976, Peter Chen had introduced the use of the entity-relationship model (E-R Model). An E-R diagram contains many entities, many different types of relations, and numerous attributes. The benefits of Entity Relationship modeling are mentioned below:

i. Databases need to be designed and entity relationship (ER) modeling is an aid to design.

ii. An ER model is a graphical representation of the system and is a high-level conceptual data model.

iii. Supports a user's perception of data and is independent of the particular DBMS and hardware platform.

4.4.1 Data Dictionary

Data dictionary or metadata can be defined as descriptions of the database structure and contents. Data dictionary defines the field, field type and descriptions of each table.

In ELONS, one database had been defined namely ELONS and contained 12 tables, which are ELONS_Notes, ELONS_test, ELONS_result, ELONS_student, ELONS_lecturer, ELONS_question, ELONS_instruction, ELONS_statistics, ELONS_announcement, ELONS_user, ELONS_course and ELONS_forum.

Database Name : **ELONS**

Table name : **ELONS_note (D1)**

Table 4-2 : Table of ELONS_note

Field Name	Data Type	Length	Note
note_id	number	10	ID of notes
note_title	varchar2	255	
note_course_id	number	10	Course of that particular note
note_week	number	10	1,2,3….
note_upload_date	datetime	10	
note_category_id	number	10	1-note 2-tutorial
Note_file_name	varchar2	255	

Table name : **ELONS_test (D2)**

Table 4-3 : Table of ELONS_test

Field Name	Data Type	Length	Note
test_id	number	10	
test_lecturer_id	number	10	
test_category_id	number	10	1-test 2-final exam
test_course_id	number	10	
test_note	varchar2	255	
test_time_limit	number	10	
test_title	varchar2	255	
Test_date	varchar2	50	

Table name : **ELONS_result (D3)**

Table 4-4 : Table of ELONS_result

Field Name	Data Type	Length	Note
result_test_id	number	10	test_id from D2
result_student_id	number	10	student_id from D4
result_grade	number	10	1:A 2:A- 3:B+ 4:B 5:B- 6:C+ 7:C 8:C- 9:D+ …

Table name : **ELONS_student (D4)**

Table 4-5 : Table of ELONS_student

Field Name	Data Type	Length	Note
student_id	number	10	
student_matric_no	varchar2	10	Matriculation number
student_email	varchar2	50	
student_name	varchar2	50	
student_test_status	number	10	0-not allow 1-allow to sit
student_forum_status	number	10	0-banned 1-normal

Table name : **ELONS_lecturer (D5)**

Table 4-6 : Table of ELONS_lecturer

Field Name	Data Type	Length	Note
lecturer_id	number	10	
lecturer_staff_code	varchar2	10	
lecturer_name	varchar2	50	
lecturer_email	varchar2	50	
Lecturer_status	number	10	1 – approved 0 – not approve

Table name : **ELONS_question (D6)**

Table 4-7 : Table of ELONS_question

Field Name	Data Type	Length	Note
question_id	number	10	
question_category	number	10	1-true/false 2-MCQ
question_test_id	number	10	test_id from D2
question_statement	varchar2	500	
question_choice_a	varchar2	255	
question_choice_b	varchar2	255	
question_choice_c	varchar2	255	
question_choice_d	varchar2	255	
question_choice_e	varchar2	255	
question_answer	number	10	1-A, 2-B, 3-C, 4-D, 5-E

Table name : **ELONS_instruction (D7)**

Table 4-8 : Table of ELONS_instruction

Field Name	Data Type	Length	Note
instruction_id	number	10	
instruction_test_id	number	10	test_id from D2
instruction_1	varchar	255	
instruction_2	varchar	255	
instruction_3	varchar	255	
instruction_4	varchar	255	
instruction_5	varchar	255	

Table name : **ELONS_statistics (D8)**

Table 4-9 : Table of ELONS_statistics

Field Name	Data Type	Length	Note
statistics_id	number	10	
statistics_test_id	number	10	test_id from D2
statistics_grade_aplus	number	10	1:A 2:A- 3:B+ 4:B 5:B- 6:C+ 7:C 8:C- 9:D+ ...
statistics_total_student	number	10	
statistics_percentage	decimal	9	

Table name : **ELONS_announcement (D9)**

Table 4-10 : Table of ELONS_announcement

Field Name	Data Type	Length	Note
announce_id	number	10	
announce_course_id	number	10	course_id from D11
announce_lecturer_id	number	10	lecturer_id from D5
announce_content	varchar2	500	
announce_upload_date	varchar2	10	
announce_title	varchar2	255	

Table name : **ELONS_user (D10)**

Table 4-11 : Table of ELONS_user

Field Name	Data Type	Length	Note
user_id	number	10	
user_level_id	number	10	1-admin 2-lecturer 3-student
user_username	varchar2	50	
user_password	varchar2	50	
user_last_login	datetime	8	
user_status	number	10	1-active 2-not active 3-disabled
user_foreign_id	number	10	

Table name : **ELONS_course(D11)**

Table 4-12 : Table of ELONS_course

Field Name	Data Type	Length	Note
course_id	number	10	
course_code	varchar2	10	
course_name	varchar2	255	

Table name : **ELONS_forum (D12)**

Table 4-13 : Table of ELONS_forum

Field Name	Data Type	Length	Note
forum_topic_id	number	10	
forum_title	varchar2	255	
forum_content	varchar2	500	
forum_post_date	varchar2	10	
forum_user_id	number	10	user_id from D10
forum_reply	number	10	0-main topic, other-reply to other topic
forum_course_id	number	10	

4.4.2 Relationships - the Class Diagram

There are three types of established inter-table relationships which are one : one (1:1), one : many (1:N) and many : many (M:N). The diagrammatic representation of the ELONS database relationship is illustrated in the Class diagram in Figure 4-12.

4.5 User Interface Design

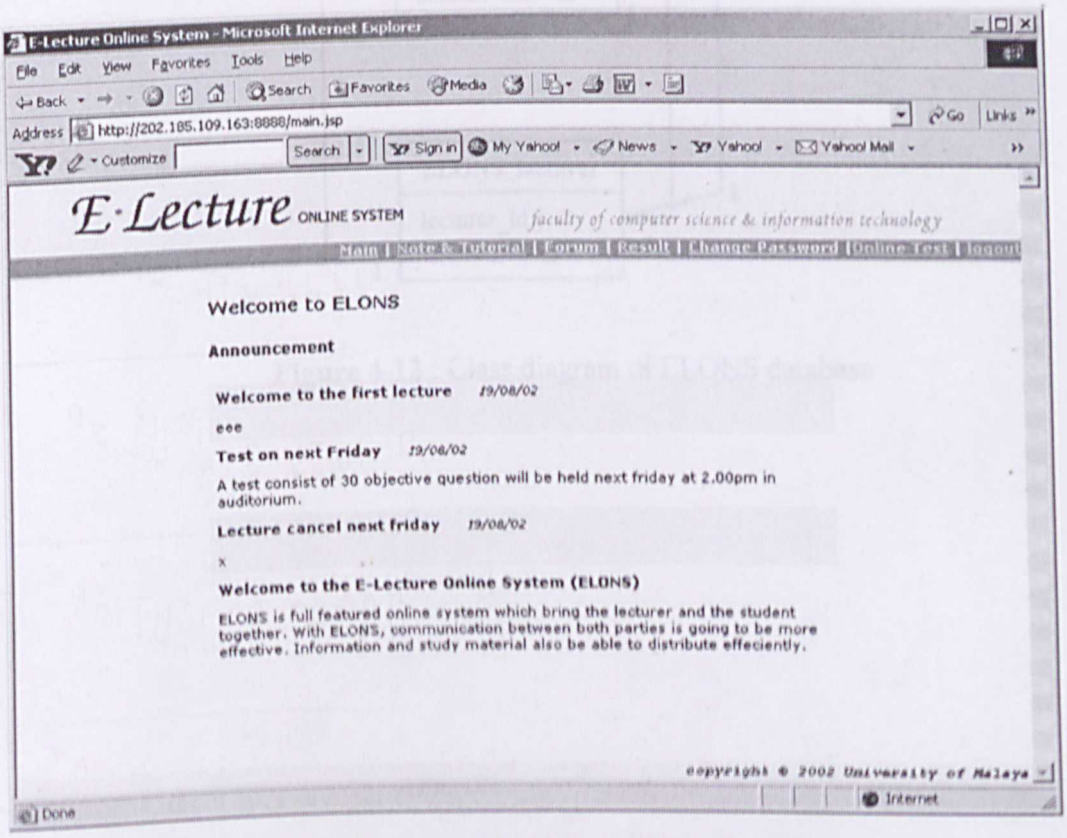


Figure 4-11 : User Interface Design

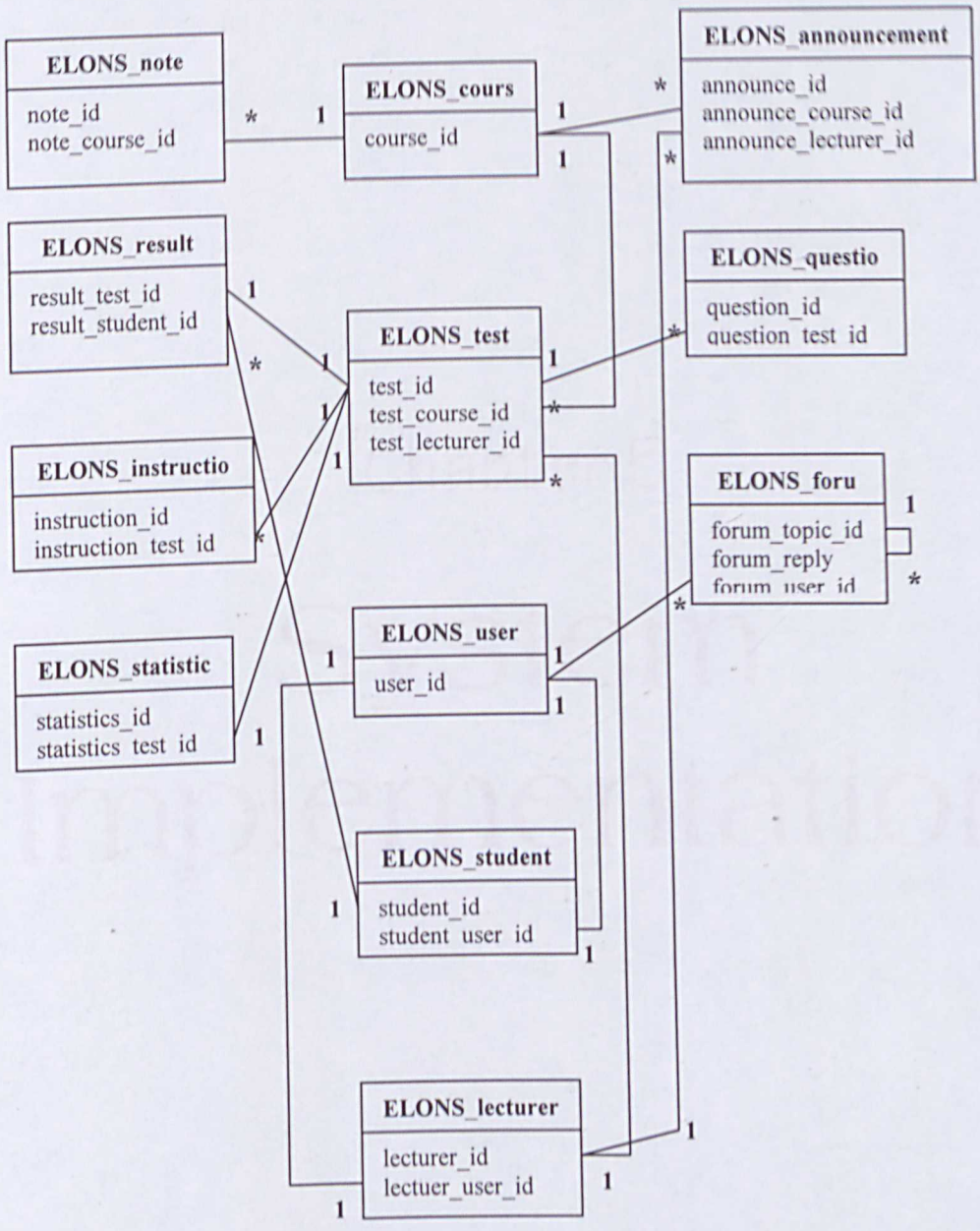


Figure 4-12 : Class diagram of ELONS database

Chapter 5

System Implementation

Chapter 5 - System Implementation

5.1 Introduction

System implementation in software development is a process to convert system requirements into program codes. The initial stage of system implementation involves setting up the development environment. This includes setting up development tools to facilitate the system implementation.

Generally, the development environment is suited according to different development phases, which can be categorized into system design, system development and report writing process.

5.1.1 System Design

Although system design is clearly stated in chapter 4, nevertheless, during the initial stage of system development, a number of considerations and adjustments were done to the initial system design in order to match the actual needs and requirements.

5.1.2 System Development

The basic tools used for the system development are:

i. Oracle 9i Application Server (J2EE Application Server)

ii. Microsoft Window 2000 Server (Operating System)

iii. Oracle 9i Database (Database Management System)

iv. Java development kit 1.3.1 (JDK)

v. Java Servlets Development kit (JSDK)

vi. Java Servlet API, JDK API, Java Mail API (references)

vii. Notepad and EditPlus 2 (Editor for HTML, JSP, Java, Perl, C/C++ program)

viii. Adobe Photoshop 6.0 (Image creation Tool)

ix. Macromedia Dreamweaver MX (Editor and interface creation tool)

x. Microsoft Internet Explorer 6.0 (Web browser)

5.1.3 Report Writing

All the problems encountered, together with solutions found throughout the processes (from system implementation until system evaluation) were recorded as well as result from system testing and system integration.

5.2 System Coding – Coding Approach, Style and Scripting Language

5.2.1 Database Implementation

For ELONS, the database is stored in a PC in which Oracle 9i Database is installed. Any data creation, updates or data retrieval will be connected directly to the database server through JDBC.

The database includes tables to keep users' details including users' authentications information. ELONS is an online application in which the lecturer can create, edit and delete any records directly into the ELONS database.

After the ELONS is completed and tested successfully, all the raw data were flush from the database. All the unnecessary tables were eliminated from ELONS database to avoid data overlapping and to reduce workload of the entire system when deployment.

5.2.2 Application Server Configuration

Oracle9i Application Server(Oracle9iAS) is the latest certified J2EE compliant application server by Oracle Corporation. It has a component named *Oracle9iAS Containers for J2EE* that is needed to run JSP. In order to execute JSP pages, Oracle9iAS should be configured to work with JDK 1.3.1 (to run Java classes) and JSDK (to run Java servlets).

Configuration to work with JDK1.3.1

Oracle9iAS does need much configure effort to use the JDK. It detect automatically during installation. In fact, Oracle9iAS come with its own JRE(Java Runtime Environment). Oracle9iAS are also a pure java application. That's why we would need JDK 1.3.x to install it. The installation command is as below:

```
c:>java -jar oc4j.jar -install
```

All the JSP pages should be allocated in

```
c:\oracle9ias\j2ee\home\default-web-app
```

All the Java classes should be allocated in

```
c:\oracle9ias\j2ee\home\default-web-app\WEB-INF\classes
```

5.2.3 Program Implementation

5.2.3.1 Coding Approach

Top-down approach is chosen to break the big modules of ELONS into functions and procedures. All these small modules or functions are built and developed separately. In the beginning stage, all the java classes are designed using object-oriented methodology. These classes were created, compiled and run and each of them perform only a specific role.

Table 5-1 : Java Class and its Task Performed

Java Class	Task Performed
MultiPartRequest.class	Upload file to the server
DelimitedDataFile.class	Read the content of text file to pump into the database.

5.2.3.2 Coding Style

JSP is used to develop the entire ELONS, with the java class used as Beans. To increase the coding readability and to help in future enhancements, a page is formed by small pieces of files through the use of "INCLUDE". This is very important as it reduces workload of system developers especially when they make changes on the layout of interfaces. Besides, it also enables system to be developed in shortest time as it allows few developers to work on separate modules at the same time.

JSP Page

A JSP page is formed by small pieces of files. Figure 5-1 indicated a JSP page(main.jsp), as all the pages include a same file of header.jsp. Therefore, whenever there are changes in the header part, all the pages will be updated at the same time. This simplifies work done during correction or updates on pages.

The Use Of Java Class In JSP Page

This is one of the part that differentiate JSP from ASP. Figure 5-2 is a JAVA file for a Java class named DelimitedDataFile.class. This class is use to extract data from a text file.

By using Java class, the concept of inheritance and encapsulation can be manipulated thus it enhances class reusability that can lead to easier system expandability.

```
<%@ include file="Connection.jsp" %> <!-- file included -->
<%@ include file="header.jsp" %>
<%@ include file="common.jsp" %>

<% //make query to the database
    ResultSet rs = stmt.executeQuery("SELECT announce_title, announce_upload_date,
    announce_content FROM ELONS_announcement where announce_course_id =" +
    session_course_id);
%>
<br>
<h3>Welcome to ELONS</h3>

<h4>Announcement</h4>

<table width=80% border=0 cellspacing=0 cellpadding=5 class=tablestyle>


<%
int i = 1;
while( rs.next() ) { %>
<tr <% if( i % 2 == 1) out.print("bgcolor=#F0F5FF"); %>>
    <td><b><%=      rs.getString(1)     %></b>     <i><font
    size=1 ><%=rs.getString(2)%></font></i></td>
</tr>

<tr <% if( i % 2 == 1) out.print("bgcolor=#F0F5FF"); %>>
    <td><%= rs.getString(3) %></td>
</tr>

<% i++; } %>

<tr <% if( i % 2 == 1) out.print("bgcolor=#F0F5FF"); %>>
    <td><b>Welcome to the E-Lecture Online System (ELONS)</b></td>
</tr>

<tr <% if( i % 2 == 1) out.print("bgcolor=#F0F5FF"); %>>
```

```
    <td>ELONS is full featured online system which bring the lecturer and the student
    together. With ELONS, communication between both parties is going to be more
    effective. Information and study material also be able to distribute effeciently.</td>
</tr>

</table>
<%@ include file="footer.jsp" %>
```

Figure 5-1 : A JSP Page – main.jsp

```
import java.io.*;
import java.util.StringTokenizer;

public class DelimitedDataFile
{
    private String currentRecord = null;
    private BufferedReader  file;
    private String path;
    private StringTokenizer token;

    public DelimitedDataFile()
        {
            file = new BufferedReader(new InputStreamReader(System.in),1);
        } // constructor 1
    public DelimitedDataFile(String filePath) throws FileNotFoundException
        {
            // gets file
            path = filePath;
            file = new BufferedReader(new FileReader(path));
        } // constructor DelimitedDataFile

    public void setPath(String filePath)
        {
            // sets the file
            path = filePath;
            try {
                file = new BufferedReader(new
                FileReader(path));
             }
```

```
        catch (FileNotFoundException e) {
            System.out.println("file not found");
        }
    } // method setPath

public String getPath() {
    return path;
} // method getPath

public void fileClose() throws IOException
{
    // closes file
    file.close();
} // method fileClose

public int nextRecord()
{
    // this method reads the next record and returns the number of
    // tokens or else returns -1

    int returnInt = -1;
    try
    {
        currentRecord = file.readLine();
    } // end try

    catch (IOException e)
    {
        System.out.println("readLine problem, terminating.");
    } // end catch
        if (currentRecord == null)
            returnInt = -1;
        else
        {
            token = new StringTokenizer(currentRecord);
            returnInt = token.countTokens();
        } // end else
        return returnInt;
} // method nextRecord
```

```
    public double returnDouble()
        {
            // this method returns the next token as a double
            double doubleReturn = Double.valueOf(token.nextToken()).doubleValue();
            return doubleReturn;
        } // method returnDouble

    public int returnInt()
        {
            // this method returns the next token as an int
            int returnint = Integer.parseInt(token.nextToken());
            return returnint;
        } // method returnInt

    public String returnString()
        {
            // this method returns the next token as a String
            String stringReturn = token.nextToken();
            return stringReturn;
        } // method returnString

    public String returnRecord()
        {
        // this method returna the entire record as a string
          return currentRecord;
        } // method returnRecord
  } // class DelimitedDataFile
```

Figure 5-2 : Java Class(DelimitedDataFile.java)

How A JSP Page Use Java Class As Bean

Java classes are invoked or called by using <jsp:useBean> tag in JSP page. For instance, the Java class DelimitedDataFile.java is called using the statement below.

```
<jsp:useBean id="reader" class="DelimitedDataFile" scope="request">
</jsp:useBean>
```

JSP page will assign user input using <jsp:setProperty> tag as below.

```
<jsp:setProperty name="reader" property="path" value="d:/electure_home/file/test.txt" />
```

So, the complete code will look like this:

```
<jsp:useBean id="reader" class="DelimitedDataFile" scope="request">
    <jsp:setProperty name="reader" property="path" value="d:/electure_home/file/test.txt" />
</jsp:useBean>
```

5.2.3.3 Scripting Language and CSS(Cascading Style Sheets)

Scripting language used for ELONS is Javascript. Unlike ASP in which vbscript can be used as another scripting language, for JSP, to create functions similar to that of vbscript can create java classes to perform the task given. In this case, the Java class has an outstanding flexibility and adaptability to the system needs.

CSS (*Cascading Style Sheets*) is also used to gain better control of the interface design.

```
<style type="text/css">
    BODY            {font-family:verdana;
                     font-size:11}
    .tablestyle     {font-family:verdana;
                     font-size:11}
    .inputstyle     {font-family:verdana;
                     font:11}
    h3              {font-family:verdana;
                     font-size:14}
    h2              {font-family:verdana;
                     font-size:16;
                     font-style:bold}
    h4              {font-family:verdana;
                     font-size:12}
</style>
```

Figure 5-3 : CSS in ELONS

```
<SCRIPT Language="JavaScript">
<!--   var popWin = null   // use this when referring to pop-up window
       var winCount = 0
       var winName = "popWin"
       function openPopWin(winURL, winWidth, winHeight, winFeatures, winLeft, winTop){
           var d_winLeft = 20  // default, pixels from screen left to window left
           var d_winTop = 20   // default, pixels from screen top to window top
           winName = "popWin" + winCount++ //unique name for each pop-up window
           closePopWin()          // close any previously opened pop-up window
           if (openPopWin.arguments.length >= 4)  // any additional features?
               winFeatures = "," + winFeatures
           else
               winFeatures = ""
           if (openPopWin.arguments.length == 6)  // location specified
               winFeatures += getLocation(winWidth, winHeight, winLeft, winTop)
           else
               winFeatures += getLocation(winWidth, winHeight, d_winLeft, d_winTop)
               popWin = window.open(winURL, winName, "width=" + winWidth
                 + ",height=" + winHeight + winFeatures)
       }
       function closePopWin(){    // close pop-up window if it is open
           if (navigator.appName != "Microsoft Internet Explorer"
                       || parseInt(navigator.appVersion) >=4) //do not close if early IE
           if(popWin != null) if(!popWin.closed) popWin.close()
       }
       function getLocation(winWidth, winHeight, winLeft, winTop){
           return ""
       }
//-->
</SCRIPT>
```

Figure 5-4 : Javascript in ELONS

Chapter 6

Testing

Chapter 6 – TESTING

6.1 Introduction

The main function of testing is to establish the presence of defects in a program and to judge whether the program is usable in real application. Nevertheless, testing can only demonstrate the presence of errors. It cannot show that there is no error in the program. Therefore, a more suitable approach must be chosen to reduce the possibility of errors in a program.

Bottom-up approach is adopted in system testing for ELONS. Each module at the lowest level of the system hierarchy is tested individually. Then, all the tested modules would be related to the next module testing. This approach is repeated until all the modules are tested successfully.

6.2 Testing Process

In general, the testing process of ELONS can be shown in the following figure. All the details will be further explained in subsequent sub-sections.

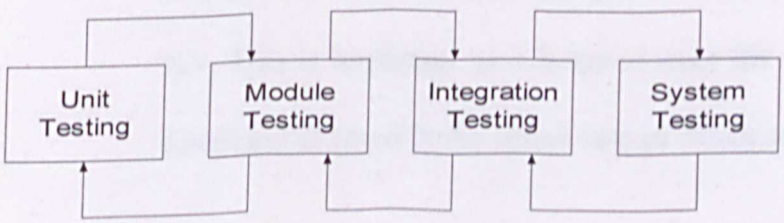


Figure 6-1 Testing Process

6.2.1 Types of Testing

6.2.1.1 Unit Testing

- Unit test is the process to test the individual component to ensure that they function properly. Each component is tested independently without the

interference from other system components. Unit test is performed concurrently with the development process.

- Techniques used during the process of performing unit testing are as follows:
    - Code Review

      Before a .java file is compiled into java class, codes are reviewed line by line to discover any syntax error as well as semantic error. If errors are discovered, they are corrected immediately.

    - Compilation of Java Class

      This method is faster compared to code review techniques and it is efficient in discovering errors. During the compilation, the Java compiler will detect type of errors in a program and display the error type as well as the line number in which the error occurs.

    - Other techniques

      If the error occurs during the loop of a function, then it will be difficult to identify the actual error. Therefore, for each loop of a function, a value is output using the command "<%= variable Name %>. This is important as it helps to trace the program and allows the developer to identify the actual step in which an error has occurred.

6.2.1.2 Module Testing

Module testing is performed without other system modules. A module consists of a collection of dependent components to perform a particular task or function. Different possible test cases are applied to the module and the test results would be verified. Unusual results will be analyzed and they would help in debugging sub-modules in order to produce the desired output.

6.2.1.3 Integration Test

Integration test is needed when all modules are integrated. The main focus in integration test is to navigate the interfaces repeatedly to detect any interface mismatch problem.

Several important aspects are checked to ensure that the flow of the data in ELONS is well organized and are user friendly to all the system users.

6.2.1.4 System Test

The sub-systems are integrated to make the entire system. Therefore, the main purpose in system testing is to find errors that result from unanticipated interactions between sub-systems. Besides, it is used to validate whether the system meets its functional and non-functional requirement.

Problems might occur by the time the new developed system is integrated to existing system. There are few possibilities that might lead to this mismatch of both new and old system

- Interface mismatch

  As ELONS is a totally separate system from the current faculty systems, ELONS has its own set of interfaces. Therefore, no interface mismatch occurs.

- Data type mismatch

  ELONS has its own database to store data needed to handle the systems operation. Nevertheless, for the beginning stage, users' personal information including their login name, email and password are retrieved from another database of an existing faculty system.

Finally, a performance test is performed to compare the integrated modules with the non-functional system requirements. These requirements include security, interoperability, flexibility and reliability.

Chapter 7

System Evaluation and Conclusion

Chapter 7 - System Evaluation and Conclusion

7.1 Introduction

Evaluation is the ultimate phase of developing a system and an important phase before delivery the system to the end users. Evaluation was related to user environment, attitudes, information priorities and several other concerns that are to be considered carefully before effectiveness can be concluded. At all phases of the system approaches, evaluation is a process that occurs continuously, drawing on a variety of sources and information.

7.2 Problems Encountered and its Solutions

JSP engine cache problem during development

When the JSP code is edited, the effect cannot be seen instantly in the browser. At first, to solve this problem, I need to delete the 'work' directory under the root directory in tomcat and restart the engine. Then I found a better way to deal with it. I edited the server.xml configuration file. Under the tag *WorkDirSetup*, the property named *cleanWorkDir* is set to true. In this way, we do not need to delete the 'work' directory manually. It is deleted automatically when we restart the engine. But later when I shift to Oracle 9iAS, it does not even need to be restarted.

Oracle Database free space requirement

Installation of Oracle 9i Database was done a few time before succesful and the installation take quite a lot of time. The Oracle 9i database need about 3.0 Gigabytes of hard disk free space for installation and to create one database in it. Because of that, I have to repartition my hard disk to enable the installation. Unlike

Microsoft SQL Server, which only takes a few Megabytes to create a database, Oracle needs about 1.0 Gigabytes to create a new database.

Debugging JSP code

My first experience in web development was using ColdFusion 4.5, which has an execellent debugging feature. So at the early stage of my development of ELONS, I found it hard to debug the code. But, luckily there are some good help on the net. One of them is http://www.jguru.com. The forum at the site has almost all the answer I need to deal with JSP coding.

7.3 Evaluation by End User

As ELONS is proposed to reduce FSKTM lecturer's workload and to make the lecturing process more effective, the final stage of system development which is the system testing becomes critical and it needs feedbacks from all respective users in judging the correctness of these functionalities, precise data flow as well as user friendliness of the system's interfaces.

Anyway, as the scope of ELONS is large, development was conducted with the objective to cover the scope briefly, which means that the whole system was developed quickly to have the overall structure and potential of the system but the system was not refined to show its full efficiency.

The overall feedback from the end users is good and ELONS is expected to serve the targeted group well after refining.

7.4 System Strengths

- Student name list extract function

  The information of students can be extracted from the text file generated by the central of U.M.'s registrar system. In this way, up to date name list is gain effortlessly although the faculty system is not allowed to connect directly to the central system.

- Test result report generator

  The students can get instant result. The lecturers can view the statistics of result without doing the calculation manually.

  Lecturers also can make a hard copy of the result list with a single click. No extra effort needed to publish the result on the notice board.

- Online Test

  Test is conducted online to reduce lecturer workload to deal with test before or after it. In this way, test also conducted in a more efficient way.

- Future integration

  ELONS is developed using J2EE, which enable better integrity in the future.

- Support high volume of users

  ELONS is deployed using the latest database from Oracle Corporation, the Oracle 9i, which is the most powerful database in the market. This make it ready to cope with large amount of user in the future.

7.5 System Constraints and Future Enhancements

As mentioned before, ELONS is still not fine enough to work at its full efficiency. Some refining work needs to be done to the system to increase its

usability and reliability. The aspects to be refine and some suggestions to upgrade the system are as below:

- Strict data type checking

  Check the input of user strictly using JavaScript to maintain the consistency of data stored and avoid error.

- Template for instructions

  Templates for the test's instructions which can be choose by lecturer to reduce typing.

- Graph for test statistics

  The system will automatically generate a graph from the statistics of test result for clearer view and better understanding of students' performance.

- Better security and consideration of the online test

  The online test can be improved to make it more secure from time to time to avoid fraud. For example what if the computer hangs during the test.

- Urgent notice using SMS

  The lecturer can send SMS to students using a phone list with a few clicks.

- Administrator management

  Tool should be added to the system to enable the administrator manage the site well.

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Appendix

APPENDIX A

E-Lecture Online System (ELONS) Survey Form

Faculty: _____ Course: _____
Year: _____

1. How do you find the current "Kursus Online" System? Do you face any problem using the system?

_____

_____

_____

_____

2. Do you approach the lecturer frequently? Why? Any problem of meeting or contacting the lecturer?

_____

_____

_____

_____

3. Any comment toward the way of conducting mid-semester test? Is getting the result fast important to you?

_____

_____

_____

_____

4. How do usually the lecturer make announcement to you? Do you miss any of them?

_____

_____

_____

_____

5. Do you have get access to the Internet easily?

- ☐ Yes
- ☐ No

Appendix B – User Manual

1.1 Introduction

E-Lecture Online System(ELONS) is an online system that make lecturing more effective and to reduce the work load of lecturers. This manual is a guide to help user to using ELONS effectively to achieve the goal.

This manual is divided mainly into two parts, which are lecturer part and student part.

1.2 Lecturer's Section

1.2.1 Getting start

1. Begin using the system by login at the login page at http://<domain_name_or_ip>/login.jsp. Using the stuff code as username and the chosen password during registration. If you do not have an account, click on the link *Lecturer Registration* at the upper right of the page to apply for an account.

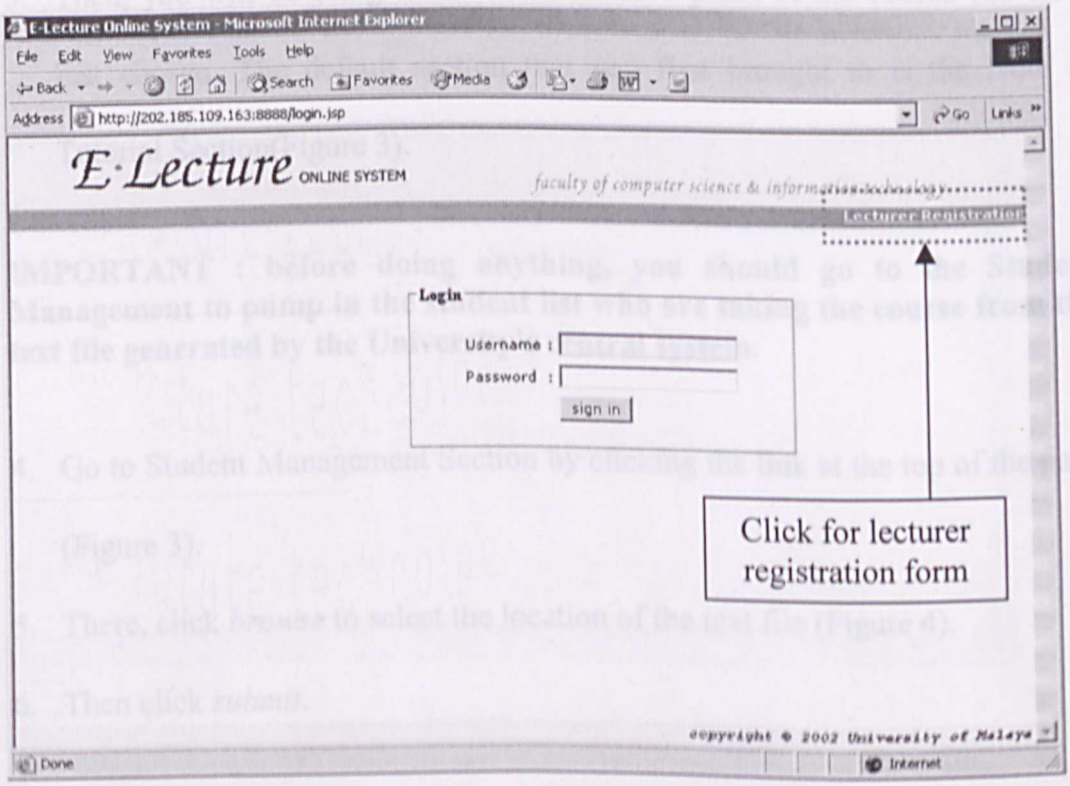

Figure 1 : Login Page

2. After login successfully, you need to choose for the course you want to manage or deal with(Figure 2).

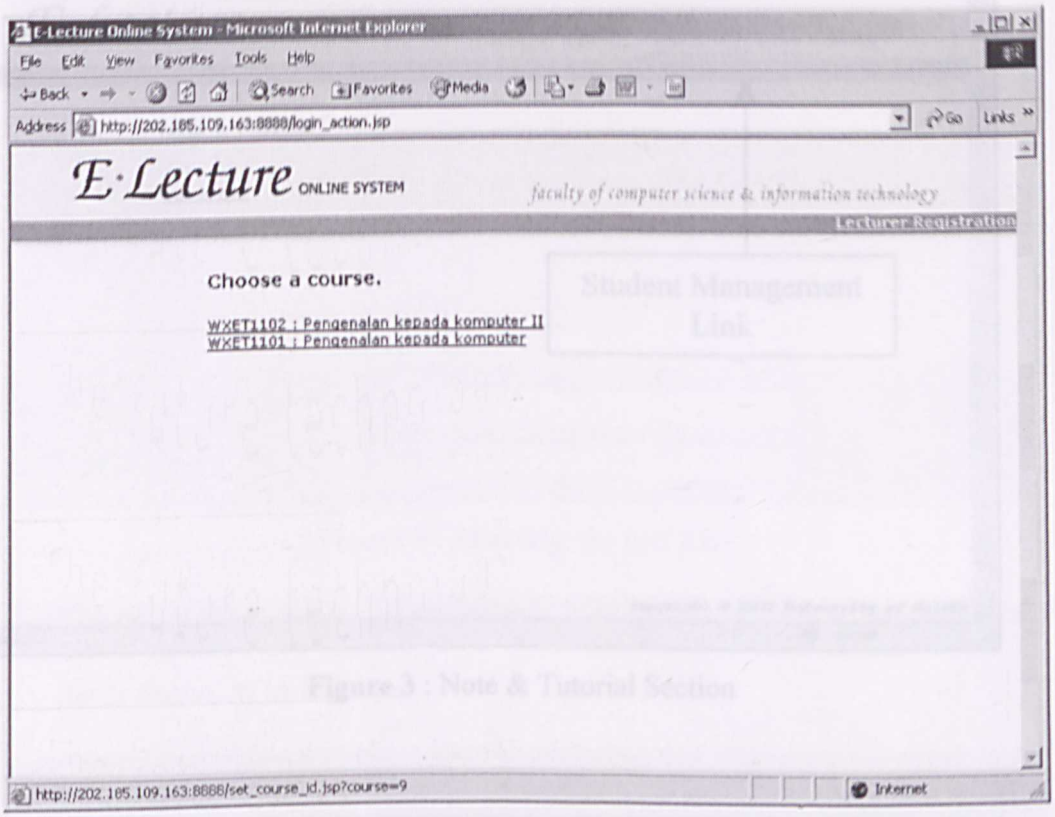

Figure 2 : Choose a course

3. Then, you will be bring to the administrative panel of the course you have just chosen. The default section that you first brought to is the Note & Tutorial Section(Figure 3).

IMPORTANT : before doing anything, you should go to the Student Management to pump in the student list who are taking the course from the text file generated by the University's central system.

4. Go to Student Management Section by clicking the link at the top of the page (Figure 3).
5. There, click *browse* to select the location of the text file (Figure 4).
6. Then click *submit*.

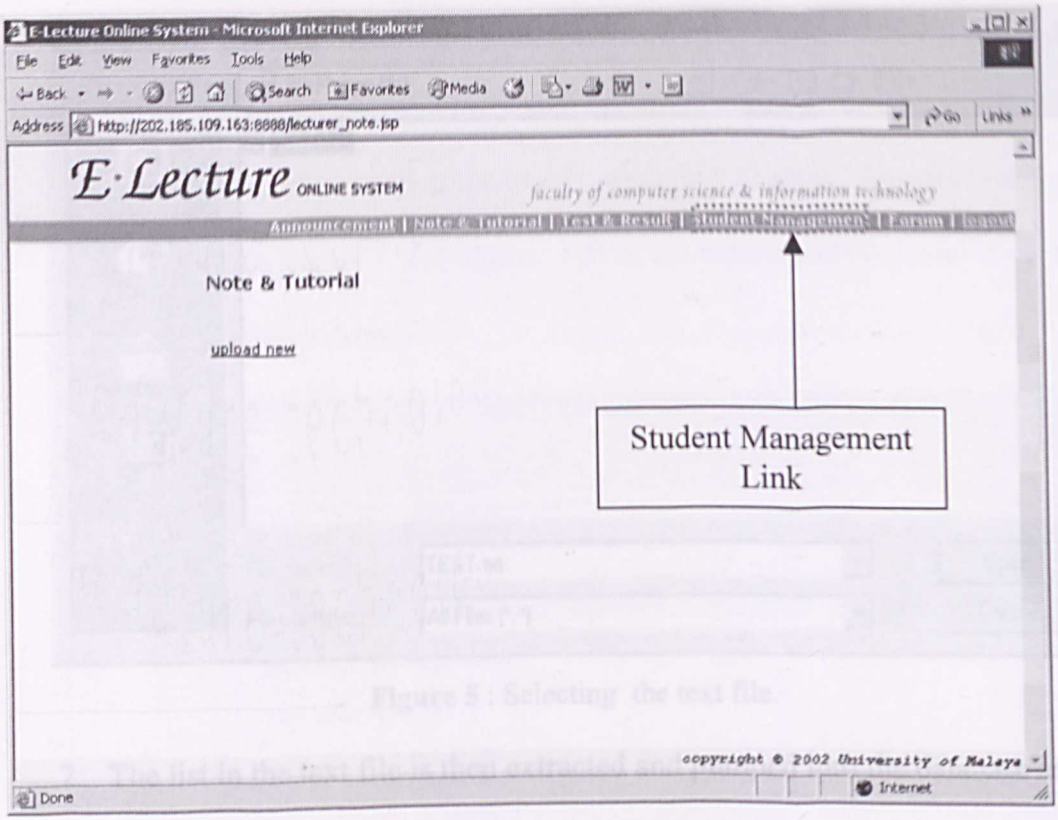

Figure 3 : Note & Tutorial Section

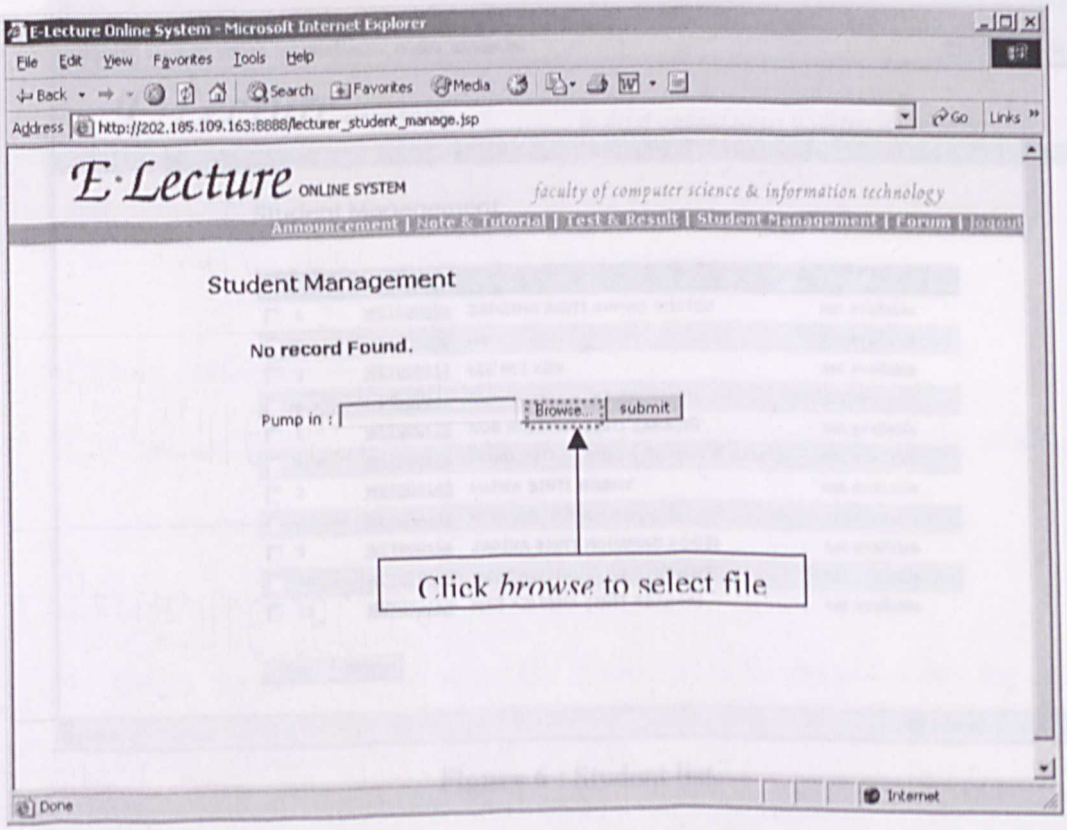

Figure 4 : Student Management Section

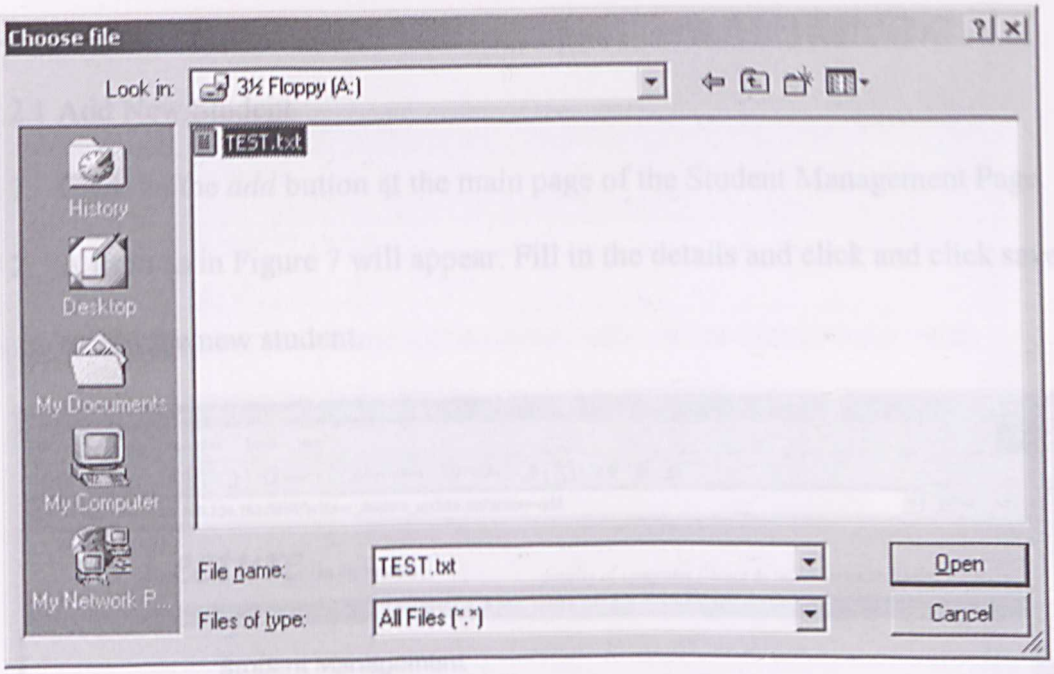

Figure 5 : Selecting the text file.

7. The list in the text file is then extracted and pumped into the database and the list is shown as in Figure 6.

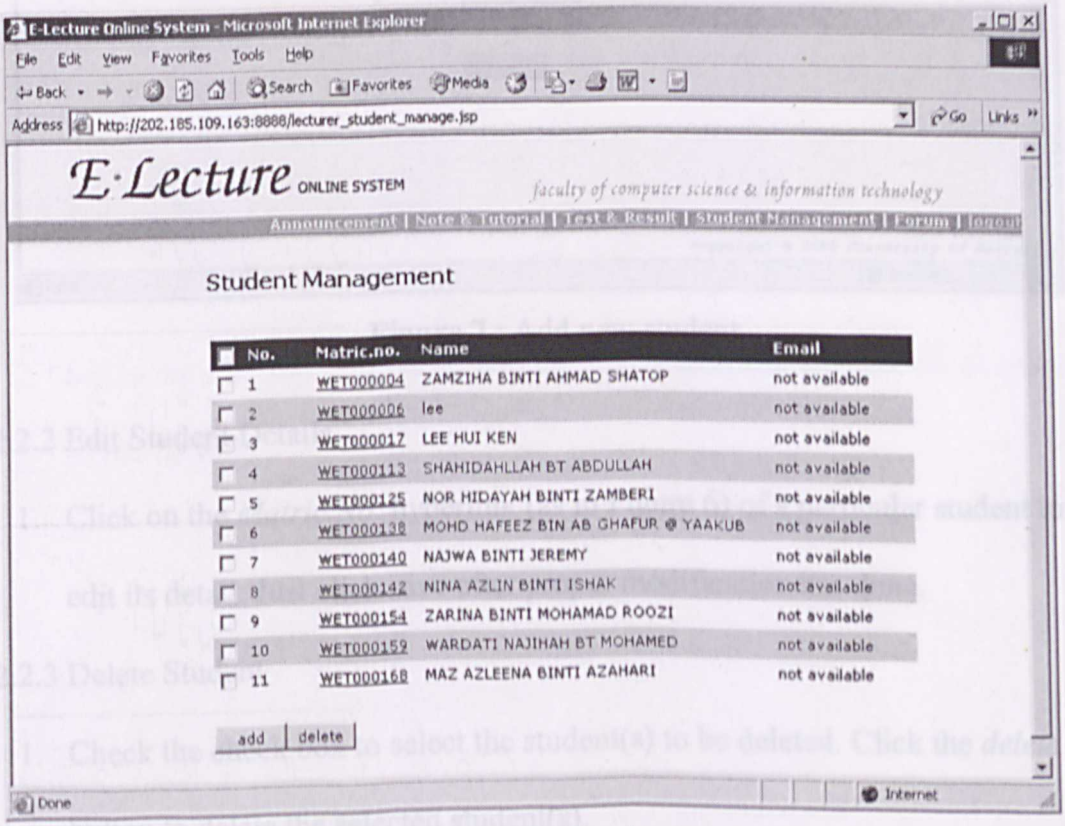

Figure 6 : Student list.

8. After this lecturer may start to use the system.

1.2.2 Student Management

1.2.2.1 Add New Student

1. Click on the *add* button at the main page of the Student Management Page.
2. A form as in Figure 7 will appear. Fill in the details and click and click save to add the new student.

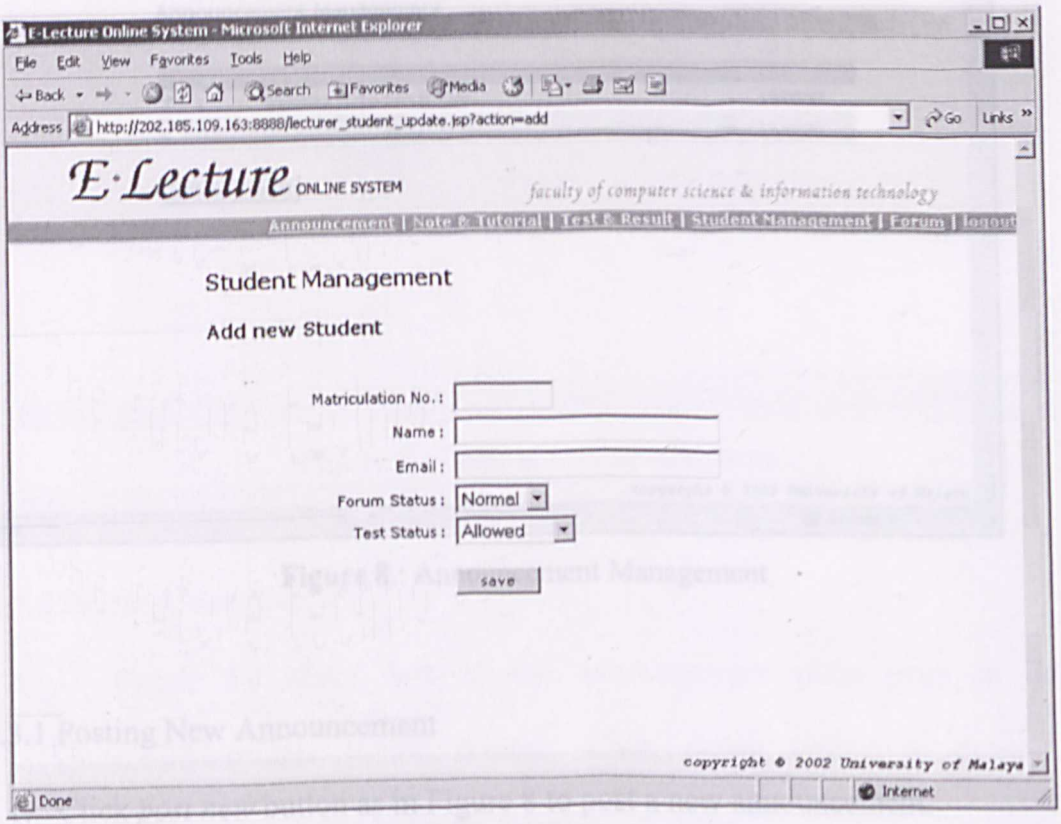

Figure 7 : Add new student.

1.2.2.2 Edit Student Details

1. Click on the *Matric.No.* hyperlink (as in Figure 6) of a particular student to edit its detail. Just click save after proper modification has done.

1.2.2.3 Delete Student

1. Check the check box to select the student(s) to be deleted. Click the *delete* button to delete the selected student(s).

1.2.3 Announcement Management

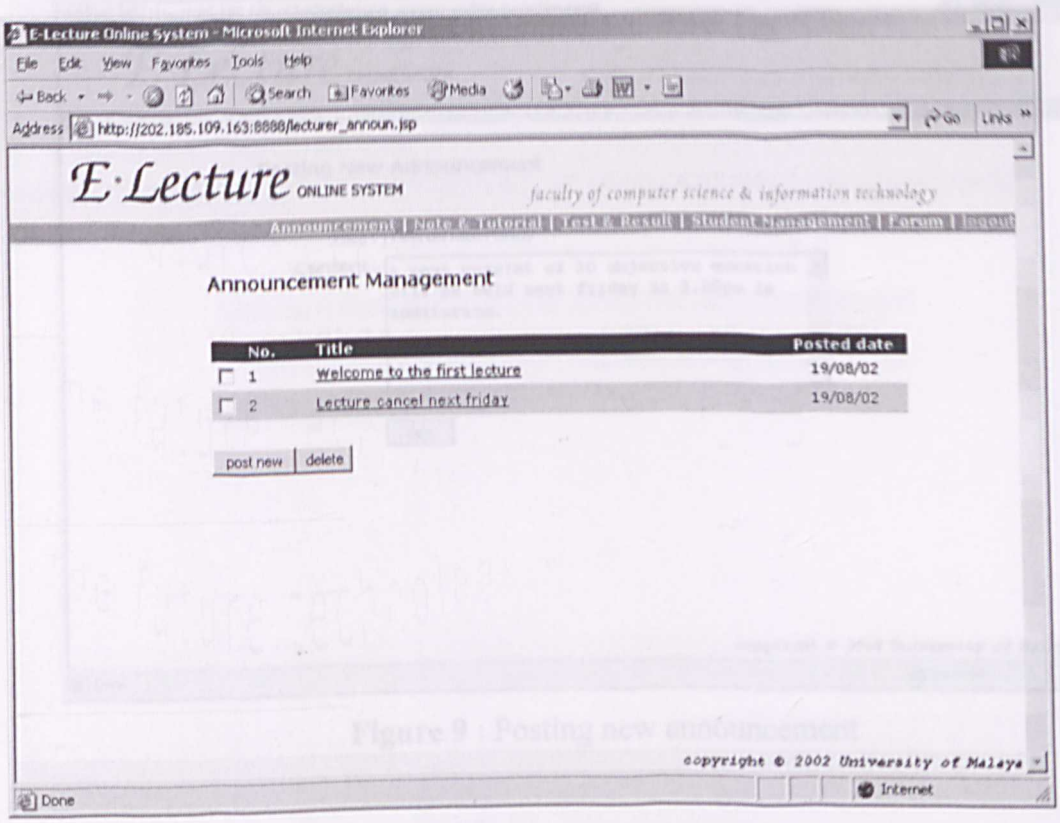

Figure 8 : Announcement Management

1.2.3.1 Posting New Announcement

1. Click *post new* button as in Figure 8 to post a new announcement.
2. Fill in the title and the content and click save to create the new announcement as in Figure 9.

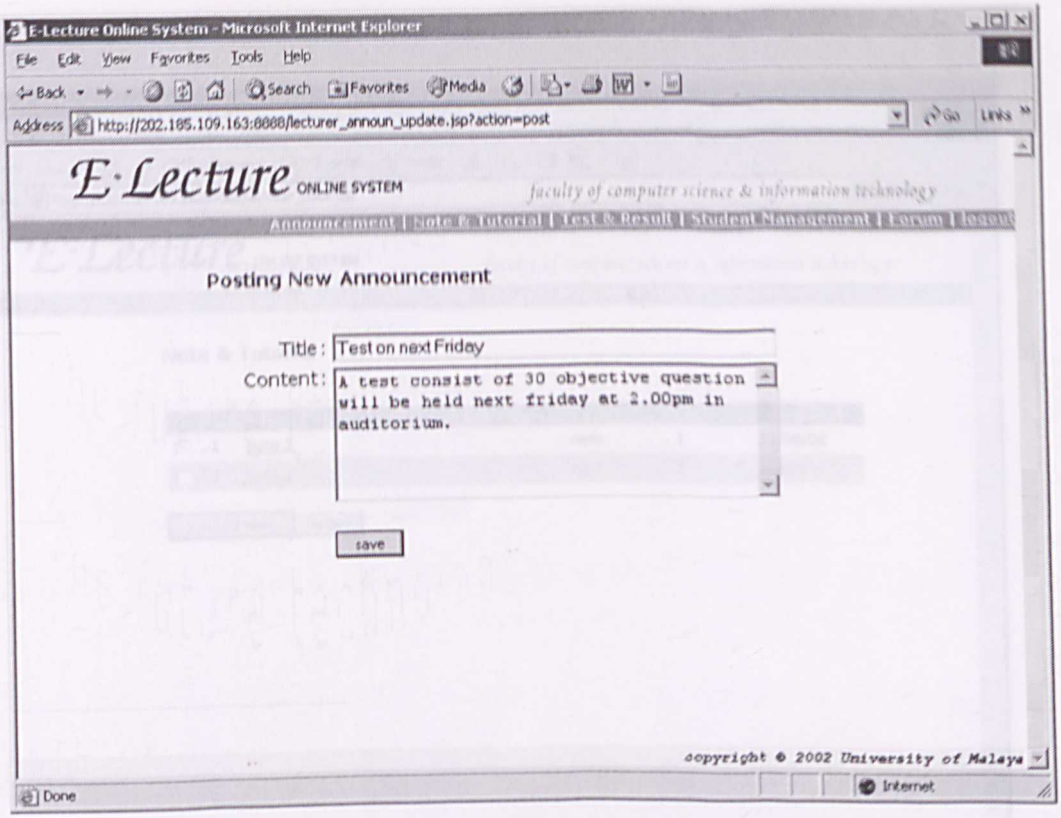

Figure 9 : Posting new announcement

1.2.3.2 Delete Announcement

1. Check the check box at the announcement main page to select announcements to be deleted. Click *delete* button to delete the announcement that has been selected.

1.2.3.3 Editing announcement

1. Click the *title* hyperlink to see the detail of a particular announcement and to edit it.
2. Click *save* after modification has been done.

1.2.4 Note & Tutorial

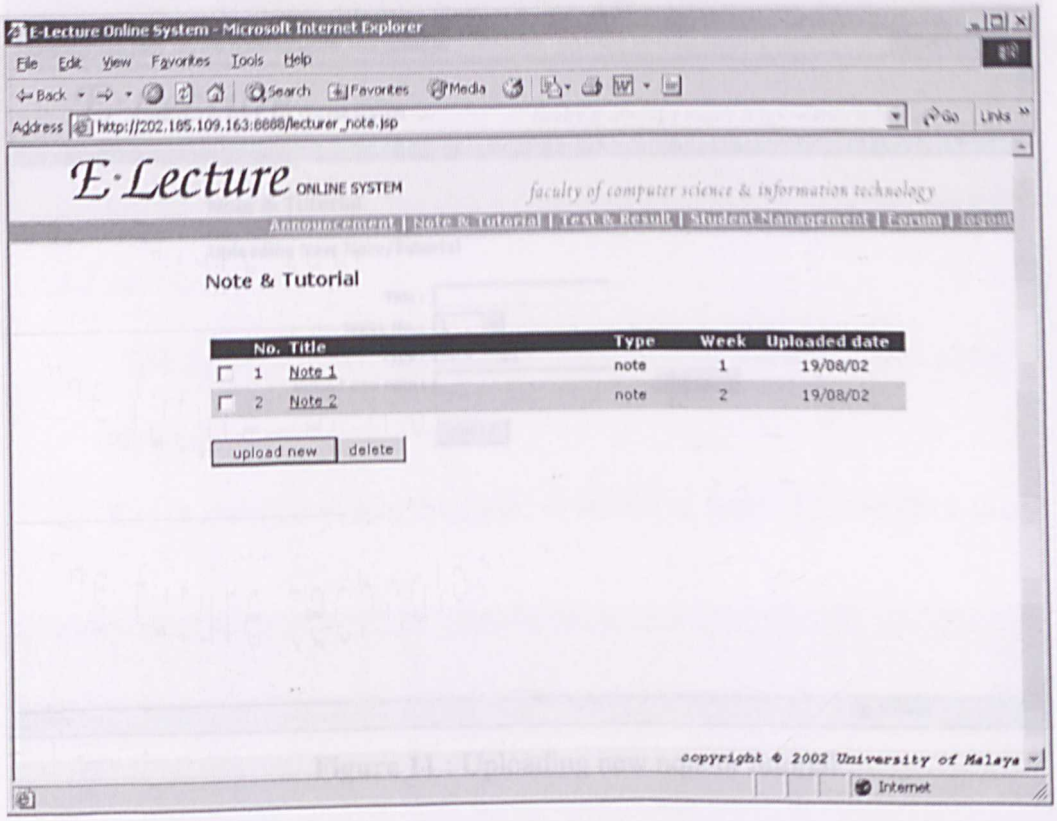

Figure 10 : Note & Tutorial

1.2.4.1 Upload New Note or Tutorial

1. Click on *upload new* button (as in Figure 10).
2. Fill in the details and choose a file to be uploaded.(as in figure 11)
3. Click *upload* button to upload the file.

1.2.4.2 Delete Note or Tutorial

1. Check the check box on the main page to select the Note and Tutorial to be deleted then click *delete* button.

1.2.4.3 Viewing the uploaded note.

1. Click on the note's title hyperlink to view its content.

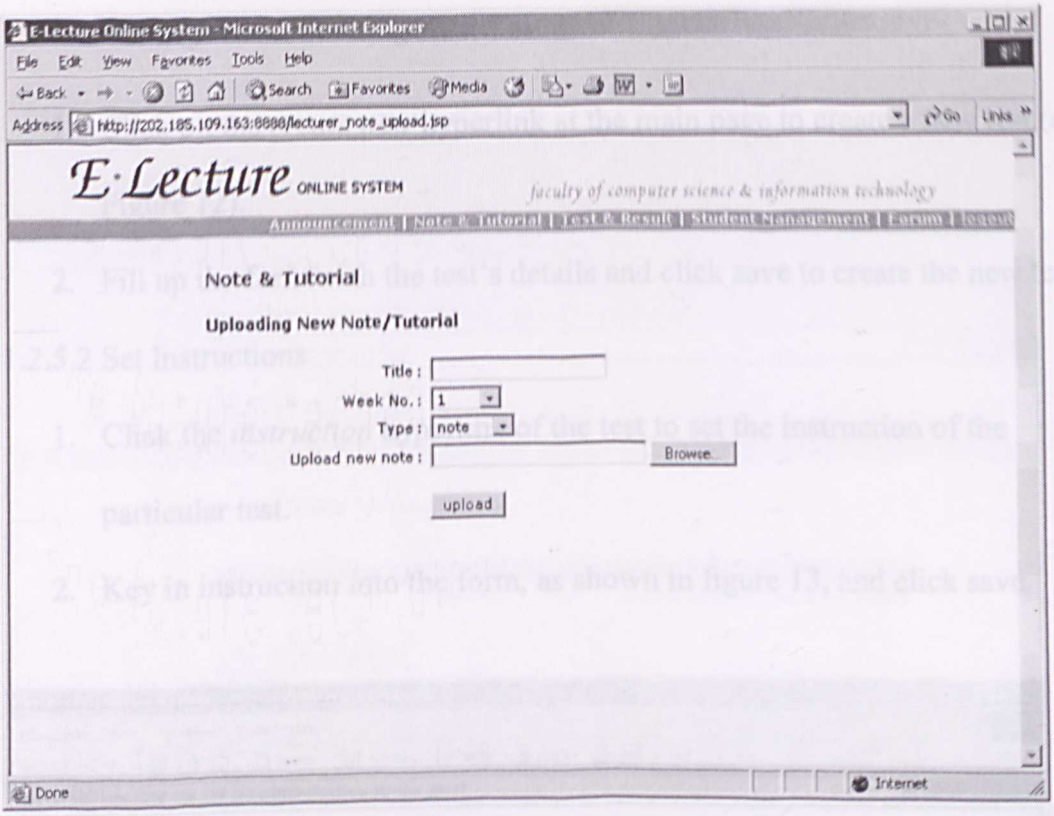

Figure 11 : Uploading new note or tutorial

1.2.5 Test & Result Management

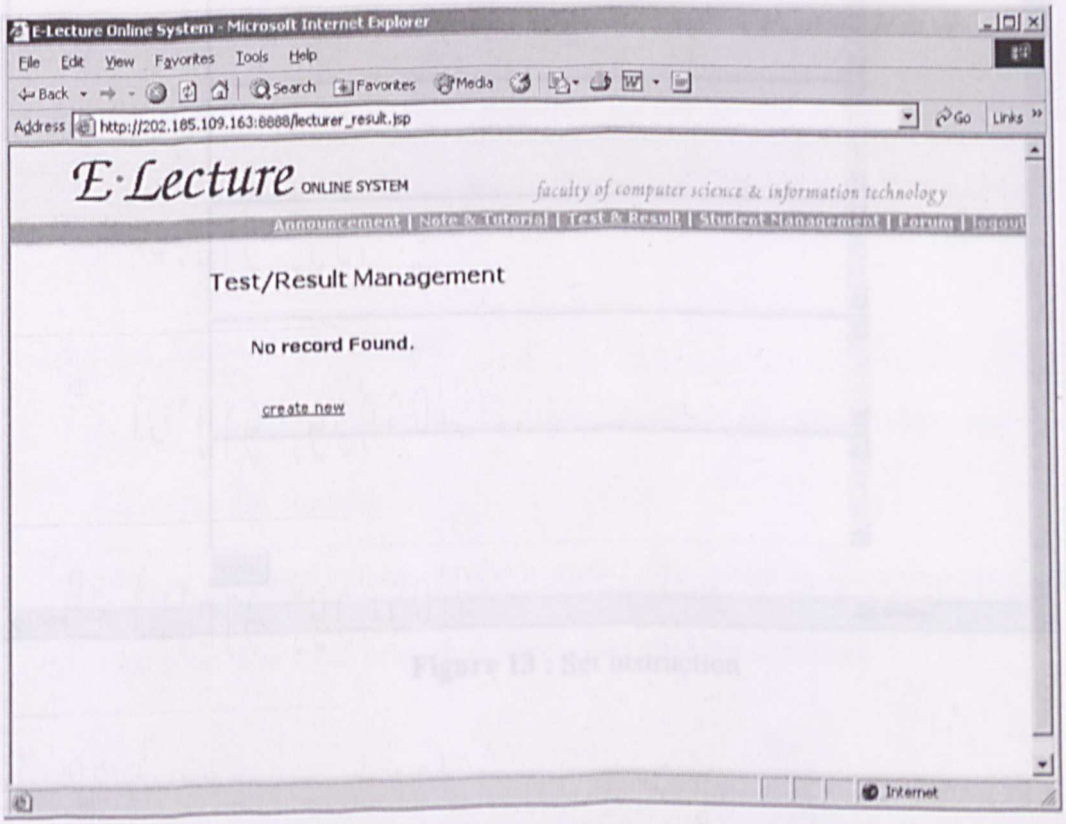

Figure 12 : Test & Result Management

1.2.5.1 Getting start – Creating New Test

1. Click on the *create new* hyperlink at the main page to create a new test.(as in Figure 12).
2. Fill up the form with the test's details and click save to create the new test.

1.2.5.2 Set Instructions

1. Click the *instruction* hyperlink of the test to set the instruction of the particular test.
2. Key in instruction into the form, as shown in figure 13, and click save.

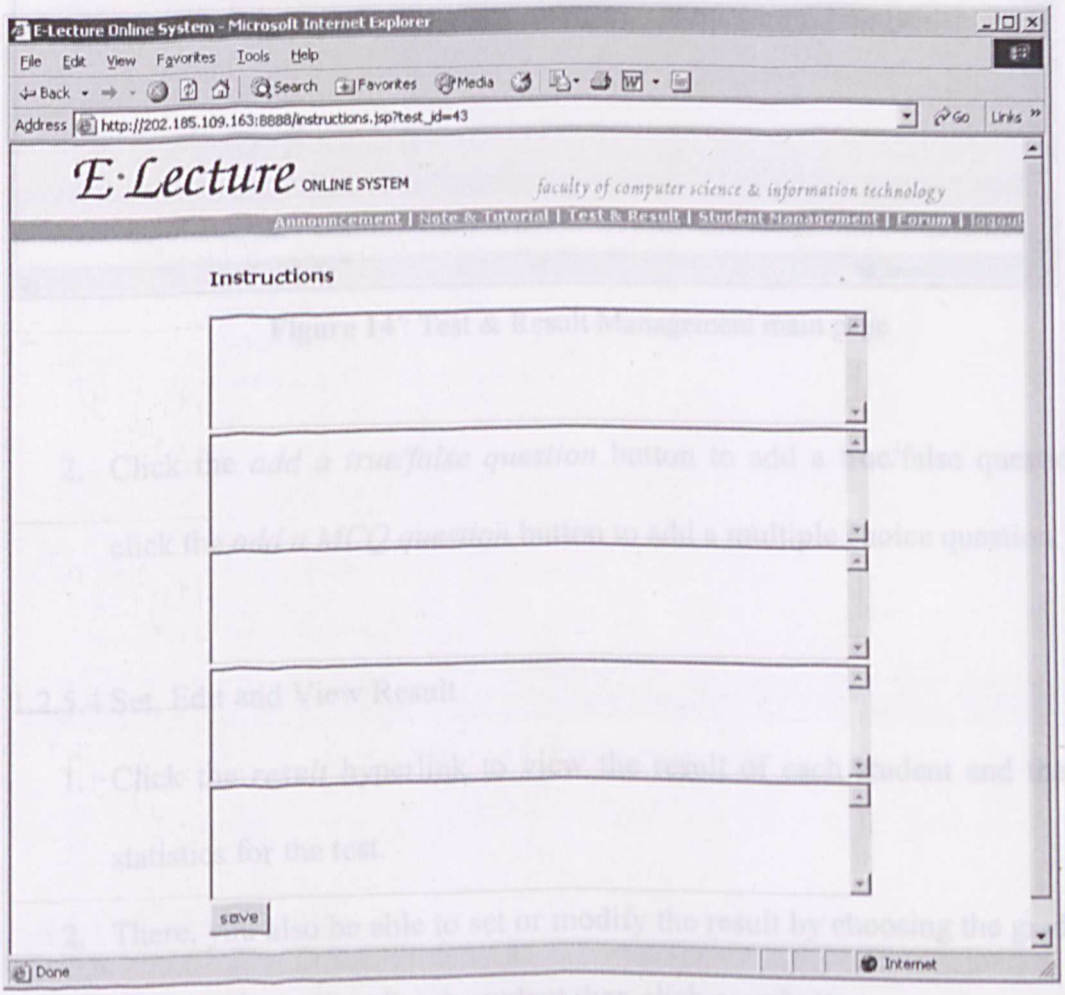

Figure 13 : Set instruction

1.2.5.3 Set Test Questions

1. Click the *question* hyperlink at the main page to set the question for a particular test.

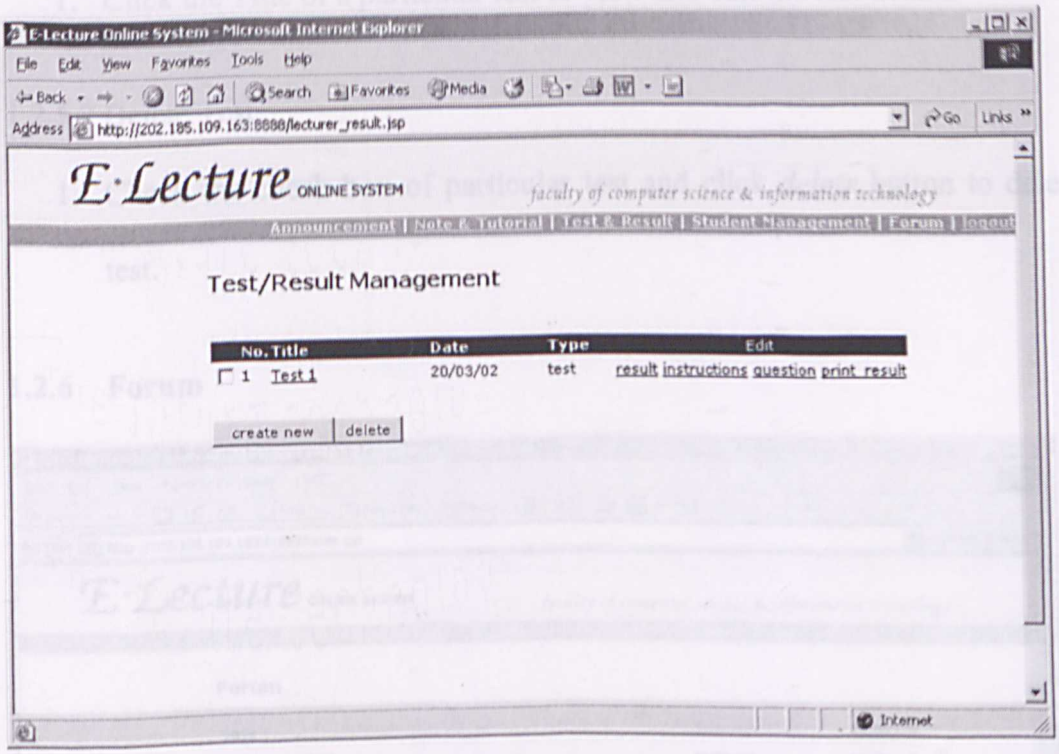

Figure 14 : Test & Result Management main page

2. Click the *add a true/false question* button to add a true/false question and click the *add a MCQ question* button to add a multiple choice question.

1.2.5.4 Set, Edit and View Result

1. Click the *result* hyperlink to view the result of each student and the result statistics for the test.
2. There, you also be able to set or modify the result by choosing the grade from the drop down list of each student then click *save* button.

1.2.5.5 Printing Result

1. Click the *print result* hyperlink and a window will pop up showing a well-organized format of the entire result.

2. Right click on the page and choose *Print* to print the result as hard copy.

1.2.5.6 Edit Test Details

1. Click the Title of a particular test to view and edit the test details.

1.2.5.7 Delete Test

1. Check the check box of particular test and click *delete* button to delete the test.

1.2.6 Forum

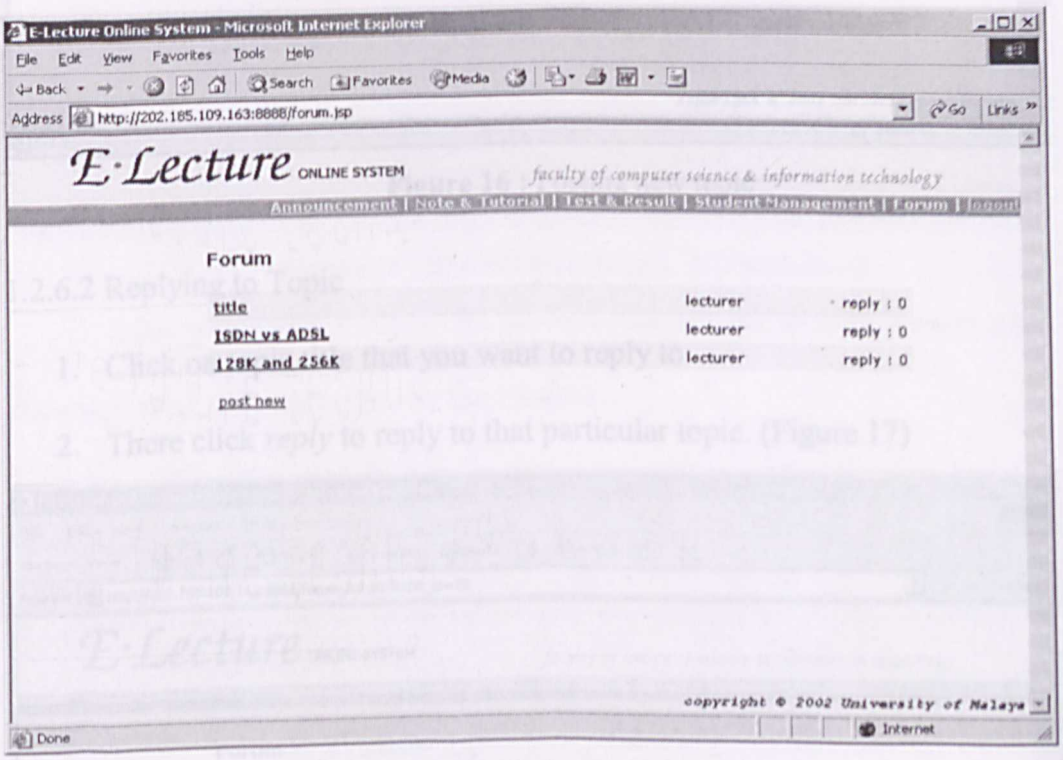

Figure 15 :Forum main page

1.2.6.1 Posting New Topic

1. Click *post new* then a form as Figure 16 will appear.
2. Fill in the form and click *post* button.

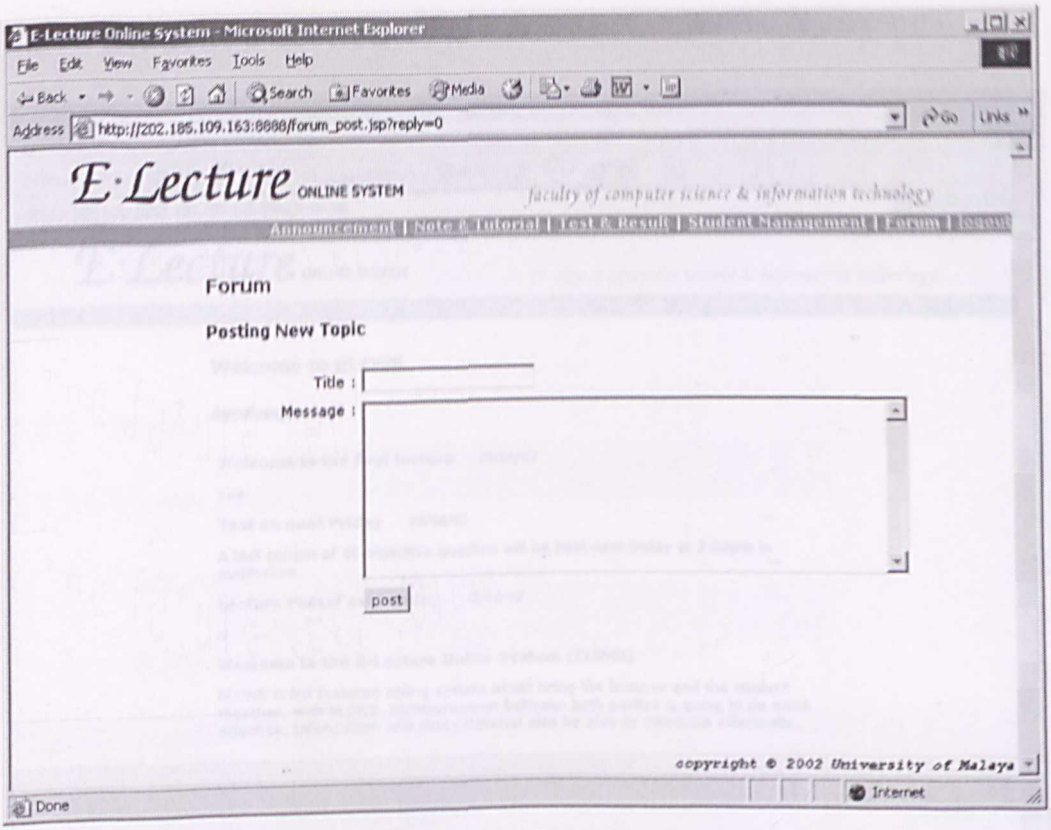

Figure 16 : Posting new topic

1.2.6.2 Replying to Topic

1. Click on topic title that you want to reply to
2. There click *reply* to reply to that particular topic. (Figure 17)

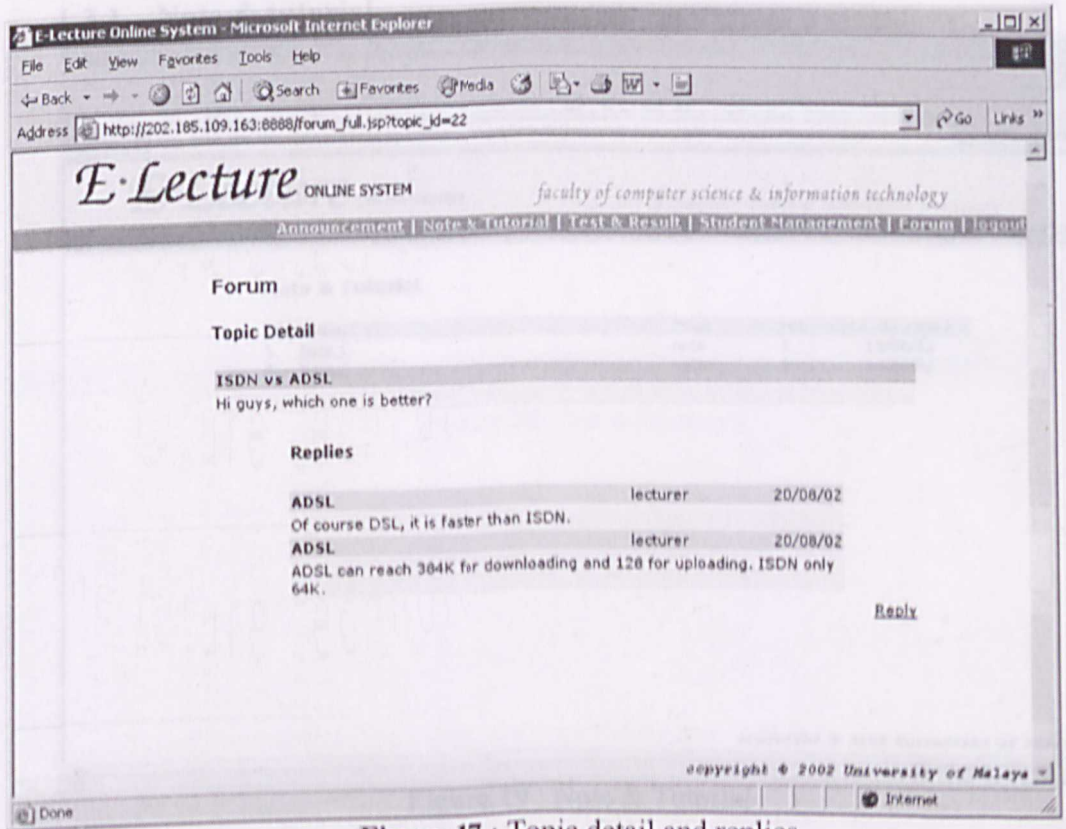

Figure 17 : Topic detail and replies

1.3 Student's Section

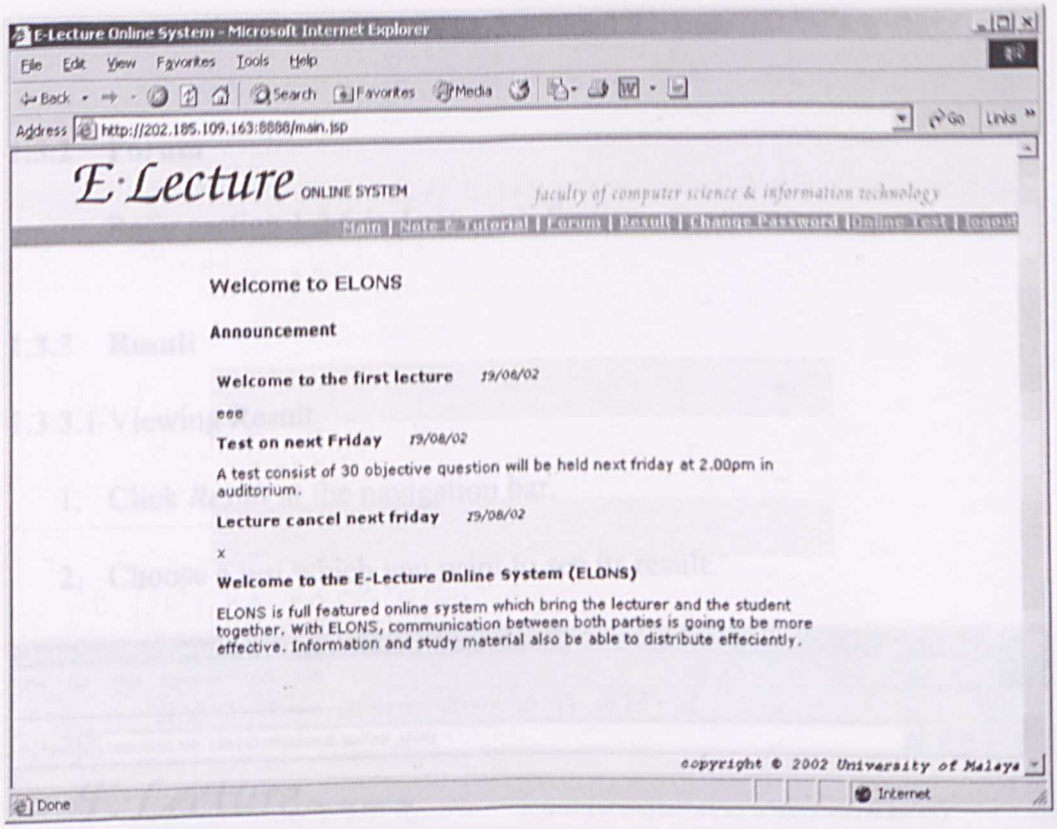

Figure 18 : Student main page – Announcement

After login as a student, the student will see the student's main page which showing some announcement by the lecturer.

1.3.1 Note & tutorial

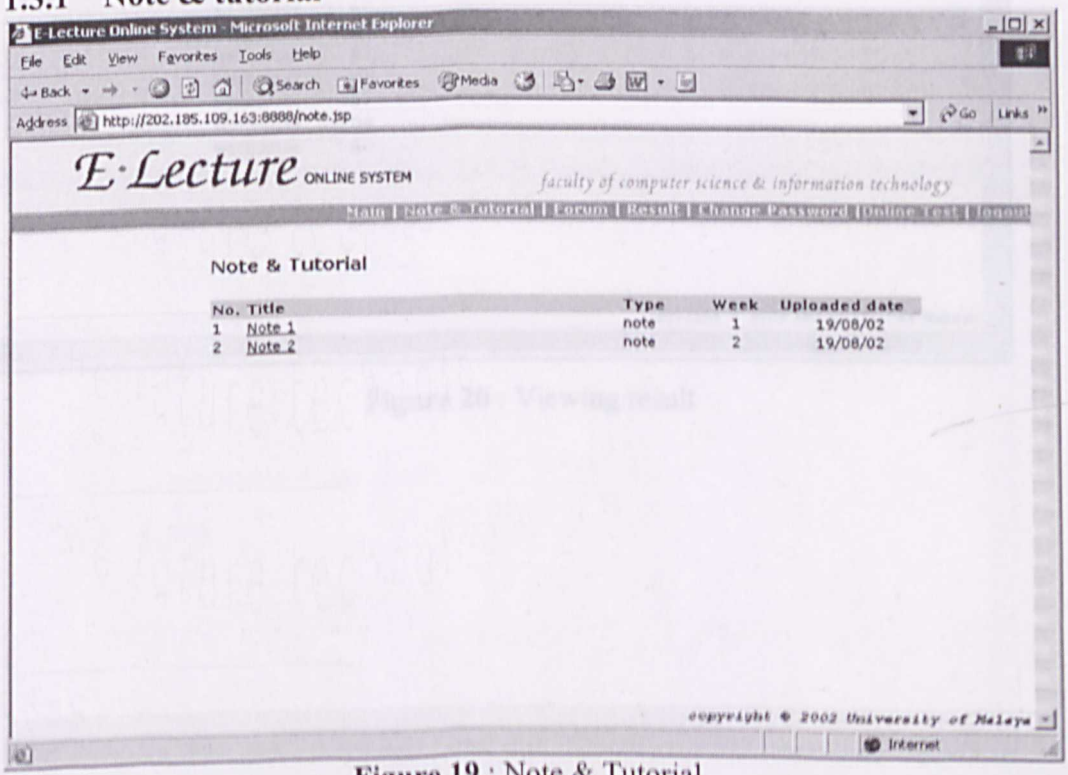

Figure 19 : Note & Tutorial

1.3.1.1 Viewing The Note

1. Just click the title to view or download the material.

1.3.2 Forum

Refer section 1.2.6 in *Lecturer's Section.*

1.3.3 Result

1.3.3.1 Viewing Result

1. Click *Result* at the navigation bar.
2. Choose a test which you want to see its result.

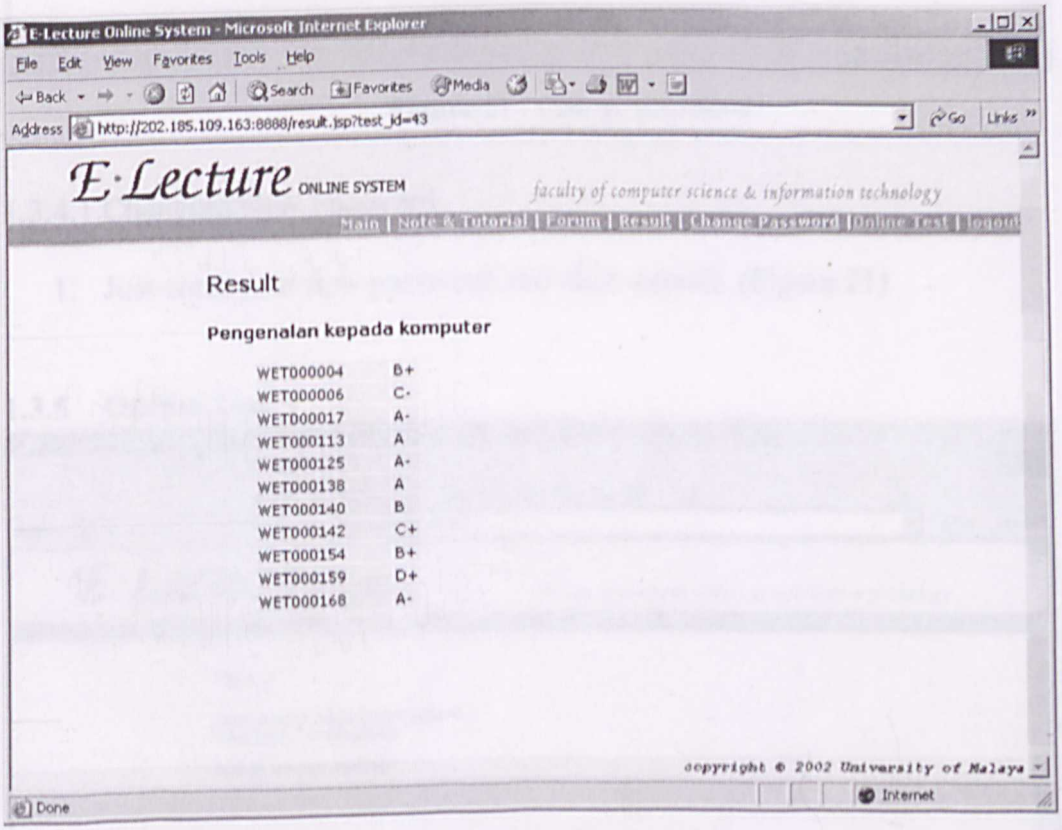

Figure 20 : Viewing result

1.3.4 Change Password

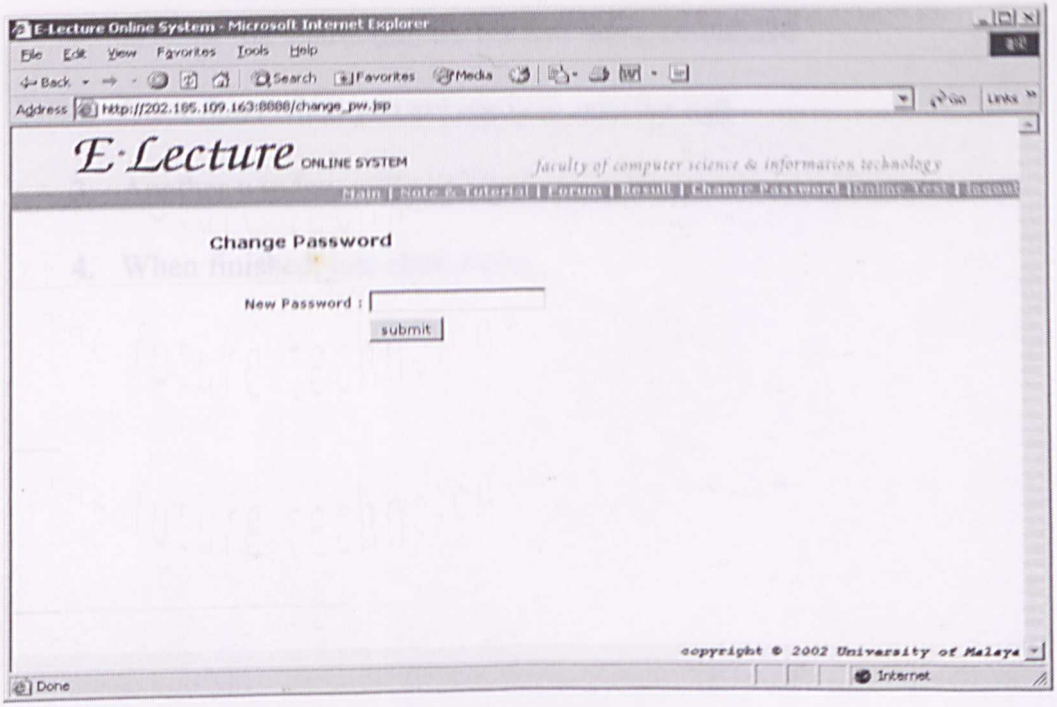

Figure 21 : Change password

1.3.4.1 Changing New Password

1. Just enter your new password and click submit. (Figure 21)

1.3.5 Online Test

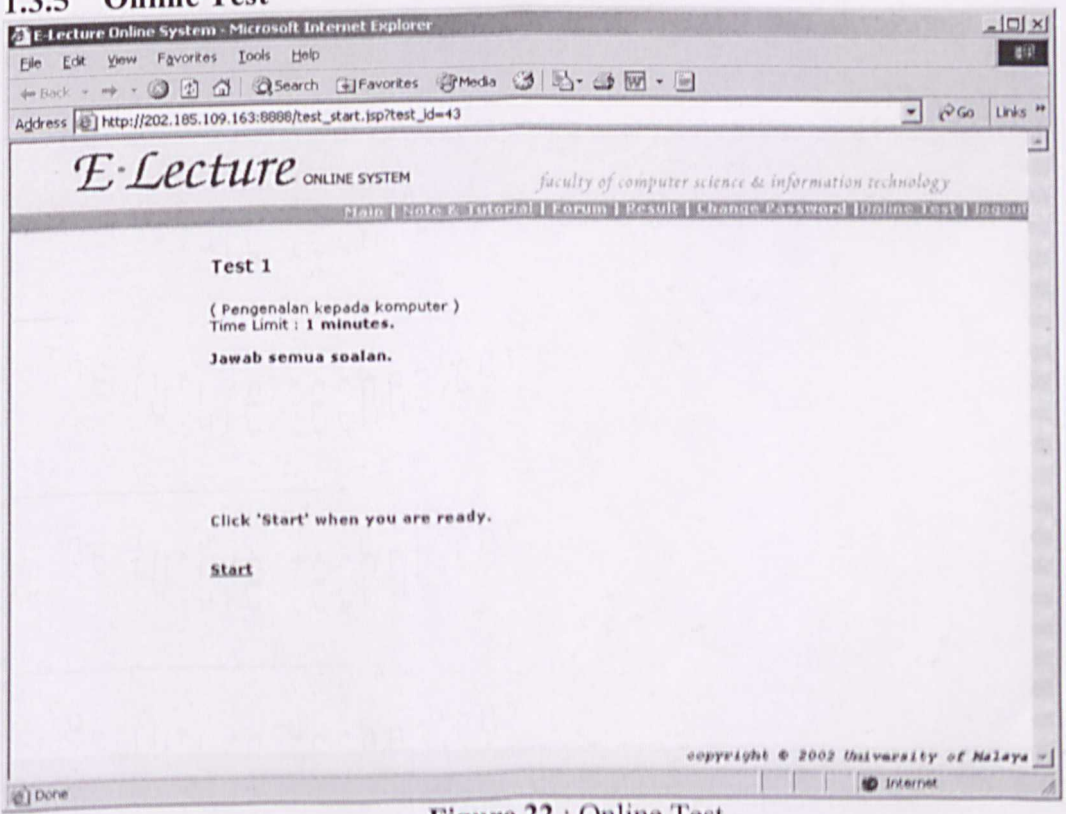

Figure 22 : Online Test

1. When you click *Online Test* at the navigation bar, a new window will pop up to show the instruction for the test being conducted.
2. Click *Start* when you are ready to start the test.
3. Another window will pop up showing the questions of the test.
4. When finished, just click *Done*.